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LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

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EDITORIAL NOTES.

Wandering Currents and Gas-Works Plant.

Six years ago Mr. H. C. Widlake, Assoc.M.Inst.E.E., of the Plymouth and Stonehouse Gas-Works, contributed to our columns an article calling attention to the detrimental effect upon gas-works plant of stray currents of electricity. He has returned to the subject in the present issue; and the contribution is of a valuable order not only on account of the cautionary advice it gives, but for the illuminating information it supplies concerning the steps which should be taken to prevent current secretly straying to earth, and finding a path in the metal work which so plentifully abounds below and above ground in a gas-works. There are some gas engineers who regard this matter as a bogey, and, possibly, Mr. Widlake as an alarmist. But after reading the present article, they may see cause to alter their opinion. It is simply common-sense to accept the fact that, if there is undetected current escaping from a gas-works electric power plant, it will find an accommodating path in the metal plant underground and otherwise—and cumulative deterioration will proceed. Being agreed so far, it follows that, if precautionary measures are available to detect otherwise unobservable escapes, then they should be applied. That such means are available is proved in the article in this issue. If the Plymouth Works, with its large utilization of electric power, enjoys an immunity from trouble in respect of plant deterioration other than can be accounted for, while some other works have deterioration troubles which cannot be accounted for, then on the face of it there is room for investigation to ascertain the cause of the difference in experience; and the electric power plant should not be voted innocent, with its potentiality for providing an unseen cause, until there is definite assurance that it is so. The means of securing that assurance should be made a permanent feature in the works' operations. Mr. Widlake writes seriously on the subject, and as an expert whose professional work is devoted to the applications of the electrical form of energy to the operation of gas-works plant. In his opinion, the question should be thoroughly studied and discussed.

During recent years there has been a great development of the use of electrical power on gas-works, and the greater the application, the more essential is it that thorough control should be instituted in respect both of installation and subsequent working of the whole electrical equipment. An important factor in safeguarding against trouble is supervision. In this respect the gas engineer can be "penny wise and pound foolish." Having incurred considerable expenditure on electric power plant, he should have a man, to safeguard the new possession, and to prevent it mischievously erring, who is, through adequate training, fully competent for the service. The term "adequate training" does not mean a student just fresh from an electrical school and without practical experience, and whose services can be secured at a nominal price. With such novitiates the electrical market is to-day flooded. Incompetent supervision of electrical plant, Mr. Widlake asserts, is at the root of most of the troubles in which stray current takes part. There are, of course, many gas-works which have small electrical plants, but which cannot afford to have a highly trained and experienced electrical engineer in constant charge. In such cases periodical inspection by an expert is desirable.

Apart from the detection and prevention of injurious nomadic currents, an illustration is given by Mr. Widlake of what proper supervision would obviate. It is sometimes found that a single-pole telpherage system is introduced into a works, and is associated with a double-pole electrical system. Under proper supervision, it would be at once recognized that this necessitates the alteration of the works' double-pole system to single-pole working, and the consequent abolition of all main and feeder switches and fuses on the negative side. Of course, from both double and single pole working, earth currents can come into existence and cause continuous damage without affecting the actual working of the plant. The greater risk of this happening is with the single-pole system. Not only is there an absence of the warning of earth lamps (which should obtain with the double-pole system), but the telpher track in the heart of the works, forming (so to speak) a huge earth plate, offers an easy objective to any currents arising from the faulty insulation of any portion of the supply system. Mr. Widlake, however, is careful not to allow his readers to assume that, although a single-pole telpherage operated from the general supply increases the risk of damage by earth currents, there is any justification for thinking that a works served by a double-pole system will be immune in this connection. Neither is there justification for installing a double-pole telpherage, in order to retain the advantages of double-pole working. But he submits that if separate motor generators are not provided for the operation of single-pole telpherage where the existing electric power system is a double-pole one, then there should be an immediate alteration of the latter from double to single pole working. But in a large system he advises that separate motor generators for the telphers should be introduced; for it may be taken for granted that the double-pole system is the safer for works making widespread use of electric power.

That is only one feature of the instructive article, which shows how earth currents may develop without making disclosure of their presence, unless there is provision for detection. It indicates how destructive such escaping current may be. It shows what should be done to discover faults, and directs attention to matters and arrangements of equipment which should be observed in order to secure the greatest attainable immunity from trouble. We leave the study of the article with the feeling that the electrical plant on a gas-works, in order to ensure the economy arising from the prevention of destructive happenings, supplies a job for an electrical specialist, such as is the author of the article, and whose presence at Plymouth is due to the recognition of this fact by the Chief Engineer (Mr. Percy S. Hoyte).

The Pure Air Campaign.

THE Smoke Abatement Conference which was held in Birmingham last week, under the auspices of the Smoke Abatement League, was (as is the Exhibition) a magnificent success, in respect of both the variety of material before those present and the publicity which was obtained for the cause through the Press. Reading the papers and the reports of the discussions, one cannot help being impressed by the differences of opinion regarding details of the subject which exist among the protagonists and advocates of smoke abatement as a means of producing better and healthier atmospheric conditions, together with a full supply of available sunlight. This points to the desirability of a better co-ordination of view and mode of action among those who are vigorously prosecuting this essential reform. We admit it is a complex subject, with ramifications of very extensive order; but, nevertheless, it would be well if some standard of procedure could be effected between the various bodies concerned in propaganda and action, and those who are interested in the subject from the point of view of suppliers of heating agents. The President (Sir Napier Shaw) agrees that we have now reached a stage in this matter when corporate action is necessary for progress.

Right at the outset of the proceedings, we come across the clash of view between prominent men in the movement. One honorary official of the League stated that the organization has come to the conclusion that its ideals could be promoted by regarding industrial coal consumers as reasonable beings, and by working with them rather than against them. From the same quarter the expression of belief came that owners of industrial power and heat plants would respond to any suggestion if approached in a reasonable manner; and through educative lines of operation, it is considered the time would come when legal compulsion would be almost unnecessary. Yet, on the other hand, we find a resolution passed that the Executive Committee of the League should take action in strengthening the Smoke Abatement Bill in the direction of providing for the deletion from it of the wholesale exemption of metallurgical processes, replacing this by a proposal that an Expert Committee of the Ministry of Health should be appointed with powers to advise exemption for limited purposes; also that the permissive powers granted to local authorities with regard to the smokeless construction of new buildings should include private houses. For the moment, we pass from Birmingham to Ramsgate, to the meeting last week of the Sanitary Inspectors' Association; and there we find Mr. W. E. Nicholson stating that of all smoke nuisance sinners the metallurgical furnaces are the worst. In Birmingham the domestic chimney was arraigned as being the worst. This shows the diversity of view which exists in the matter of procedure in advancing an excellent cause. We are afraid that both lines of procedure—the educative and the legislative—are necessary, and, in fact, are complementary. Recognition must be made of the fact that human frailty, obsession, and stubbornness are as strong among manufacturers as other people. The educative process alone would be adequate if all manufacturers were reasonable, and wise in respect of their own interests in the matter of a detail of their work, because, after all, the provision of power or heat in a factory, although it is highly important, is only an item in the total of works' costs, and therefore a detail. We have been long enough connected with this question of smoke abatement to know that the educative process is slow in its results; and the reason must be sought in two directions. Either the methods of educating the manufacturers are not efficient, or the receptivity of many of them is of a low standard. If the former is the main reason, then it means that the methods adopted by such organizations as the Smoke Abatement League should be studied with a view to promoting a standard of greater effectiveness; if the want of receptivity, appreciation, or negligence of some industrialists is the main reason, then, where smokeless heating can be applied, it would be no hardship on them if sufficient legislative powers existed to compel practices which would have the dual advantage of promoting public health, and producing, through greater works' efficiency, economies in their business. The progress of invention in the use of gas, coke, and electricity has made it much easier than was the case a few years ago for manufacturers to comply with a condition which is indisputably desirable. It is distinctly a question which must be examined from all points of view. There is recognition on our part that remedial measures cannot be standardized for the whole country, or for a set of industries in any one area. There is also agreement that a great deal of good might result from a proposal made at the meeting that regional organizations should be formed for the general discussion among the manufacturers of smoke-prevention methods, and their collateral advantages. But, above all things, the procedure in connection with this vital work demands, in order to realize the best results, proper co-ordination between the propaganda bodies and other organizations representing the industries concerned.

Regarding domestic heating, no one would at present submit that the open fire should be in this country entirely abolished by law; but we do think that the time has arrived when there should be some limitation applied to the consumption of raw coal in dwelling-houses, more especially as it is almost unanimously admitted by experts that the cumulative results of the emission of smoke by domestic chimneys have a greater effect in the pollution of the atmosphere than industrial operations, where, as a rule, higher temperatures prevail in the use of raw fuel, and therefore the smoke is really of a less pernicious character. In view of this, we strongly hope that the efforts that are being made to secure the introduction of an amendment in the Smoke Abatement Bill will be realized, by specifically including private dwellings in a clause proposing that urban authorities should be given powers to make bye-laws requiring provision in new buildings of such arrangements for heating and cooking as are calculated to prevent or reduce the amount of smoke. This would merely be permissive, and not obligatory. But unless some such amendment can be secured, it may be many years before there will again be an opportunity of statutorily commencing an attack on the domestic side of the smoke nuisance. On the point of the contribution that gas is making to the reduction of the pollution of the atmosphere, Dr. Margaret Fishenden remarked that, although it is claimed—probably rightly—that the increasing use of gas cookers has minimized fogs, this is probably only in certain congested areas where gas cookers are more plentiful than is generally the case throughout the country. What is claimed by the industry is that gas has assisted to minimize the severity of smoke pollution, and therefore of fogs; and no one who studies the circumstances from a practical point of view could deny that the claim can be well substantiated everywhere. Consider the number of gas cookers, gas fires, water-heaters, and wash-boilers there are in the country; consider then the quantity of raw coal they have displaced for the work they perform, year in year out. Had it not been for the suppression of the burning of raw coal to the extent that is represented by the use of these cookers, fires, &c., what with the increase of population and houses, and therefore of chimneys, the conditions of the atmosphere—particularly in times of fog—would have been vastly worse than anything ever experienced in times past. In making comparisons, we are prone to overlook the potential increase of the nuisance, had there been no counteracting influence at work.

A very important matter also received incidental references during the progress of the conference—that is, the building of rooms without chimneys or shafts in them to provide not only for products of combustion, but for proper ventilation. Sir John Robertson, Medical Officer of Health for Birmingham, made the remark that all rooms should be ventilated in as efficient a manner as possible. The efforts of electrical people in trying to have houses built with flueless bedrooms, with the idea of making such houses preserves for electric heating, is opposed to Sir John's prescription that such apartments should be ventilated as efficiently as possible. A flue is a better ventilator than a perforated brick in the upper part of the room. We are, therefore, glad to see that in the paper by Mr. Raymond Unwin, the Chief Architect of the Ministry of Health, and Mr. Pointon Walker, the Chief Assistant Architect, a sharp attack was made on flueless bedrooms, which shows that this matter is before the

Ministry of Health. No doubt the Ministry will do their good part in checking a movement which is strongly opposed to healthful conditions. It is admitted on all hands that electric heating is not economical; and there is no justification for saving a small outlay on the structural work of houses to the detriment of the health and pockets of the occupants. We see no reason why this point of flueless rooms should not be dealt with in the Smoke Abatement Bill. It is a matter worth consideration, and should be followed up by all who have at heart the best interests of the community.

The Birmingham Conference was a good and fruitful one; and we believe it will have a very beneficial effect upon the promotion of the cause, which all concerned in the gas industry can and do thoroughly support.

Old and Modern Carbonizing Plant.

In this issue an article is published, prepared from a few details relating to the gas-making experiences with the five-year-old large installation of Woodall-Duckham verticals at the Provan Gas-Works of the Glasgow Corporation; but there are a few points in the article which we wish to emphasize here, as there is an express desire that no use should be made of the figures in any way which would not allow proper interpretation of them. In the first place, there is the question of the thermal production per ton of coal. The figures given per ton must not, in justice to the continuous vertical system, be taken as any index of the producing ability of the retorts with other coals. The coal used in the Provan retorts is that which best pays the Corporation through its availability; and that is why the thermal production per ton—not only in this case, but others—is an unsafe criterion of judgment without full knowledge of the coal itself. The next point is the greater productivity per unit of area, and the savings effected, compared with the old horizontal retorts which the verticals displaced, and with the present-day horizontals and "B.W.G." at the Tradeston Gas-Works. Here we have an excellent illustration of the profitableness of capital expenditure when the higher efficiency and economies over the old plant will more than repay the charges entailed by its supersession. Not everywhere in the gas industry has the lesson been learnt of the economy of scrapping, when the advances of knowledge, engineering, and operating methods have opened the way. Another point is that it is no reflection upon the engineers who were responsible for the previously installed horizontals that the new occupants of the site, through fresh engineering achievements, have higher efficiencies and the capacity for more material economies. The advances came after those engineers. They utilized the knowledge of their times, and operated to the rule of then prevailing enactment and conditions, and did their best. There cannot be the slightest doubt that others will come after us who will do, with new engineering accomplishment, much better than is being done with those things which we, from our standpoint, regard as *ne plus ultra;* but that will be no reflection upon those now carrying executive responsibility for the technical welfare of the industry. The Provan experiences in carbonizing 1½ million tons of coal contain striking lessons.

District Settlements and National Agreements.

We pause over the second part of the above title in its relation to the coal stoppage and dispute. The first part seems relatively simple; the latter part presents to our mind mountainous difficulties, and many new volcanic eruptions. Last week was wholly occupied with discussions over the offer (which was vague in its terms) of the Miners' Federation to enter into negotiations for a new national agreement, with a view to a reduction of labour costs to meet the immediate necessities of the industry. The Chancellor of the Exchequer and other members of the Government (acting in the absence of the Premier) first met representatives of the Mining Association; and all Mr. Churchill's argument would not lead them to consent to enter into a fresh national agreement for the industry, but they promised to refer the matter to the District Associations. Then the Chancellor made a dramatic recall of certain representatives of the Miners' Federation from the Trade Union Congress at Bournemouth, and had a midnight conference with them on Tuesday, to obtain from them the precise connotation of the terms of their letter—particularly of the words "reduction in labour costs." Mr. Churchill's interpretation was that the words covered wages, hours, reorganization, and, in fact, any pertinent thing which would lead to a reduction of costs, which, on the face of it, was too good to be true. It met with a prompt repudiation from Mr. Cook, whose activities leave the rest of the Executive of the Federation deeply in the shadows. He says the Federation claim the right to go into the conference (if one is arranged) with "open hands" to discuss the whole position. This seems to accord with the Chancellor's interpretation; but Mr. Cook thinks it does not. It is what has been sought of them time after time during the past four months; but they have consistently put obstructions in the way of open discussion, which left practically nothing to discuss or to negotiate upon. Mr. Cook's idea seems to be that what they have been doing must not be done by the other side. Moreover, the interview with the miners was followed by a letter from Mr. Churchill to the owners, which proposed a hybrid plan of district settlements, which should be referred to a central body for confirmation, or reference back to the district, and then, when—the "when" may be emphasized—there is final adjustment of differences, the whole of the settlements could be embodied in a national agreement. This means that after owners and miners in a district have agreed, the same men who have, through their policy, brought the industry and the country into a critical state, are to be the final arbiters over those most concerned, and better qualified than the Federation to effect a settlement; inasmuch as, though the central body was comprised of an equal number of representatives of the Mining Association and the Federation, if the latter disagreed with a settlement, the fat would again be in the fire.

Considering this—considering, too, the eight months' stoppages which, in the short space of five years, the industry and the country have suffered through the Federation and the national agreement, and all that such stoppages involve to other industries (including employment)—the middle course of trying to synthetize district settlements and a national agreement appears to us to be nothing but another way of ensuring the retention in the hands of the Federation of a power which their foolish acts have shown should not be entrusted to them. Mr. Churchill is only pandering to the desire of the Federation to keep in their possession the weapon of a national strike, and to maintain the footing on the nationalization road which national agreement gives them. Moreover, there would be no end of trouble in conditioning an agreement between the miners and the owners which would give effect to the Chancellor's scheme. So long as the Federation objected, a district settlement might be inoperative, and no national agreement would be effected. If it were effected, the country would find that a national agreement and national strikes would still be intimate companions. The country has lost confidence in the Miners' Federation as a mentally well-balanced governing organization; and it is little short of surprising that the Government should have settled on a proposal such as the one which is before the country to-day. The difficulties of the situation can be freely admitted; but, the country having passed through all it has done owing to the policy of the Federation, it does feel that the future as well as the immediate present should have the fullest consideration and protection against a permanent menace. Sight should not be lost of this in any settlement.

Reverting to the interview that Mr. Churchill and other Ministers had with the coal owners, there is another point which calls for comment. Mr. Churchill, referring to the objection of the owners to a national agreement, stated that, had the Government known a new obstacle to a settlement would arise, they would never have passed the Eight Hours Act or proceeded with it. There is nothing inconsistent between the owners' opposition to a national agreement and the Act. If the statements of the Prime Minister are properly interpreted, the principle upon which that Act is based is to allow the question of hours to be settled upon district lines; for he stated over and over again that the Act was not obligatory, but permissive. The

Seven Hour Act also remains; and therefore the miners and owners can settle upon any length of shift between those hour limits, just as best suits the needs of the collieries or districts. That plainly indicates and facilitates district agreements.

We all want to see the coal industry fully operative again; but the country, having suffered so much, desires that full operations should be resumed on a basis which will not be overclouded by the uncertainty that has obtained during the past five years, and will not subject it to a repetition of the troubles of 1921 and 1926. Perhaps the views in this article would be somewhat modified if there were more details available instead of the mere outline of the Chancellor's plan for bringing district settlements within the compass of a national agreement; but, forming an opinion on the broad principles alone, the scheme appears to be a device for realizing the desires of the Miners' Federation, by divesting district settlements of their independence. In other words, a big organization has only got to make itself unpleasant enough to move even the British Government to do what it desires.

Just before going to press, we learn that, with the exception of one small inland district (in Warwickshire), the twenty-four District Coal Owners' Associations have declared against entering into any national agreement. In a letter to Mr. Churchill, Mr. Evan Williams states that the District Associations are willing to meet the local Miners' Associations at any time, and no objection is raised to the principle of wage regulation by results, minimum percentage, or subsistence wages. These decisions "arise from a deep and earnest conviction that settlements on a national basis, by linking the industry with politics, inevitably take the consideration of purely industrial questions out of their proper economic sphere, have been destructive of peace and prosperity to those engaged in the industry, and, as experience of the immediate past has shown, are a menace to the community as a whole." The owners are right in these views. Time, however, passes. The flow of men back to the mines up to Monday is represented by only a few short of 55,000. Surplus British coal for stocking does not at present look very promising.

Electric Lighting Campaign.

THE great electric lighting campaign, for which the slogan has been adopted "Wiring the Homes of Britain," is about to commence. To be exact, Oct. 1 is the appointed day for starting the great push. It is considered that the kindly offices of the Prime Minister and the Government in boosting electricity during the last eighteen months have provided an excellent opportunity for a display of energy throughout the country from within the industry, which, however, appears to require some little working-up to bring it to the proper degree of co-operative effort. The electrical papers have all, in excellent harmony, been beating the campaign drum at the instance of the Electrical Development Association and the Electric Lamp Manufacturers' Association, who are going hand in hand in the organization and conduct of this great enterprise. The material composing the articles on the subject in our contemporaries shows that it has had common origin, with the necessary embroidery supplied by the different writers.

We will not attempt to go through all the points which have been raised in connection with this essay, which is to surpass anything of the kind previously attempted by our business rivals. But, briefly, it is considered that their natural development lies through lighting—this being regarded as the easiest door by which to enter. Then, having got so far, the lighting consumers supply the best ground upon which to operate for securing additional cooking and heating business. To make the campaign comprehensively effective, the country has been divided into seven areas, in each of which a Committee has been appointed, with a paid organizer. Each Committee will form electrical circles within its area, the task of which, during the coming winter, will be to spread the electrical gospel. Advertising is to be simultaneously conducted on an elaborate scale—not only through the newspapers, but by posters and well-circulated literature. It is also hoped to have a complete chain of all-electrical homes through the country for public inspection. The campaign is not only to be among the public, but supply authorities are also to be the subject of attack, in order to induce them to take-up with greater energy "assisted" wiring schemes; and the method of doing this will be to supply the backward ones with details of the successes of those who have already adopted the "assisted" system. For the public, there is also to be, as previously announced in the "JOURNAL," a mammoth competition, which is stated to be all-electric in its conception and in its rewards. It will take the form of a ballot in which competitors will be asked to arrange in order of popularity the twelve cardinal virtues of electric lighting. We do not know whether there is a "catch" in this, but it will be difficult honestly to find twelve cardinal virtues. The first prize is to be an all-electric home worth £2000; and there are numerous other prizes, which will take the form of complete electric installations down to single electric appliances. The programme of the complete scheme is being posted to about 8000 interested parties in the electrical industry, so that the electrical operators in the country will be well saturated with the details of the big push. Furthermore, the scheme is to be inaugurated by a luncheon at the Hotel Cecil on Sept. 17, to which the lay Press is to be invited.

In connection with the campaign, prominence is being given to a number of statistics which are evidently intended to stimulate the electricity industry into general activity and greater enterprise during the next six months. It has been said by electrical computers that the number of houses in Britain is approximately 10,000,000. Of these 7,000,000 are situated in electricity supply areas; but the number of houses wired only total 1,400,000, which means 20 p.ct. of the houses in electricity supply areas, or 14 p.ct. of all houses in the country. In these areas, it is pointed out, there are 5,600,000 houses which would have a capacity for consuming 1,400,000,000 KW.-H. If each of these houses had an installation which cost £20, it would mean the provision of £112,000,000 worth of new business; and the same number of new purchasers, spending on an average £20 on fittings, lamps, cables, &c., would represent a further £112,000,000 expended in the electrical trade. What an attractive objective? The calculations have a striking appearance; but between present conditions and the realization of the objective, there stands public preference and a not inactive gas industry.

We have recently suggested in the "JOURNAL" that the electricity industry cannot go on developing its business in low-priced units without at the same time making progress with the higher priced ones for lighting. Year by year some of the undertakings have shown that their average revenue per unit of electricity sold has been on the down grade. This is satisfactory from one point of view; but it cannot continue indefinitely. Statistics which have recently been published referring to electricity supply undertakings in the United States show that only about 25 p.ct. of the total energy generated in 1925 was consumed for lighting, but the revenue from lighting was as much as 67 p.ct. of the total. In this condition of affairs will be seen a very good reason for the necessity of a considerable increase in the lighting load. Hence the campaign.

Eltham Tenants' Revolt.

Further information regarding this matter is given in our "Electricity Supply Memoranda" this week. The tenants on the Eltham Housing Estate of the Woolwich Borough Council, it will be seen, are heartily pursuing their campaign to obtain freedom from being harnessed by the Council to the electricity undertaking for both lighting and cooking. They want gas; finding that electricity is too much for their pockets as a heating agent, and has a lower operating efficiency than gas. It is stated that at least 100 of the tenants have purchased oil-stoves for cooking, preferring them to electricity, but it is gas they are after. Fancy electricity driving people back to oil for such a purpose as cooking, and a hundred of them on a single housing estate!

Coal Imports.

During August, 3,970,442 tons of coal, costing £7,542,847, were brought to this country—an average of practically £1 18s. per ton. The progress that has been made in the import of coal is shown by the following table:

—	Tons.	Value.
		£
May	3,618	5,983
June	600,634	966,290
July	2,319,657	4,147,995
August	3,970,442	7,542,847

Troubled Waters at the "T.U.C."

The Trade Union Congress at Bournemouth last week was most edifying. A general bad temper prevailed, and there was a fine demonstration of the antithesis of brotherly love. At times the proceedings sank to the level of a brawl; and Mr. A. Pugh found his Presidential seat not a comfortable one. The general strike was at the bottom of it all. The delegates have realized that their power falls far short of the high peak to which, only a few months ago, they had elevated it in their own minds; and naturally they felt not a little sore. The temperaments of some of them are of an order which, when they feel sore, impel them to be "nasty;" and nasty they were. They did not even approve of the insolence of Comrade Tomski, who in a cabled illiterate and insensate message, applied the knout to the trade union leaders of this country with a vigour which they will not readily forget or forgive. The idea of British trade unionists being instructed as to what they should do, and how they should act, by these Soviet fanatics is an impertinence, and an offence to the dignity and manhood of some of them. But what Tomski said is not half so severe as what Mr. Cook threatens to say of the "T.U.C." Council after the struggle of the misled miners is over. At the Congress, he did not want any "washing of dirty linen." That has got to come. But nevertheless at Bournemouth he appealed for greater financial support for the miners from the other unions, some of whom are almost bankrupt through the general strike, and the "No, No" policy of Smith, Cook, & Co.

The General Strike.

The President, in his address, made some illogical and unphilosophic references to the general strike, the disastrous folly of which is proved by the facts that it did no service, but ended in menacing the very existence of several of the unions. The only thing Mr. Pugh could say in its favour was that it was an inspiring and convincing manifestation of unity, loyalty, and determination on the part of the movement. He had little to say about the manifestation of loyalty and determination on the part of the people of the country in frustrating the evil intentions of the General Council of the "T.U.C." He said nothing about the unlawful acts which they committed; nor did he say anything regarding the manifestation of repugnance on the part of a large section of the rank-and-file at the dishonourable breaking, by command, of their employment contracts. Nor did he say anything as to the tremendous split there has been among the members of the unions for being called from their employment without a ballot being taken and proper notice being given to their employers. There are a multitude of honest trade unionists, who are averse to dishonest action. The omissions from the address project from it with greater prominence than the phrases constituting the references to the general strike. There was a grand silence over other phases of the strike, which, instead of helping the miners, did them more harm than good. The statement was made by Mr. Pugh that the general strike weapon would be retained in the armaments of the trade union movement. But when the discussion came as to giving extended powers to the Council in regard to future national stoppages, it was found that the Council did not want to be saddled with more authority than they at present possess. This has proved somewhat irksome.

The Aftermath.

The aftermath of the general strike is not at all pleasing to the leaders of the unions. They know it has produced for the movement a grave reaction, and did no possible good; on the contrary, it left the position of unemployment in a worse condition than before. The general strike was a creator of unemployment, and that is not a function of trade unionism. The astute Mr. Bevan says it is all very well to call men out, but the difficulty is to get them all back again, if there is not the employment there for them through the strike. Mr. Cramp of the "N.U.R." told the conference plainly that the loyalty of their people must not be strained too far; they "have had some." He cannot find that the success of the general strike is at all obtrusive; and he knows thousands of men who entertain very grave doubts about it. The Right Hon. J. R. Clynes, when speaking on the motion for extended powers being given to the General Council, pointed out that if such vast authority is conferred on one central body, he cannot see any good in having a thousand separate trade unions in existence. He is right. Separate, and self-functioning, unions there must be. They represent definite industries, working under definite conditions, and having their own individual problems, which cannot be adequately supervised and dealt with by a central body. There is no question that the general strike has engendered new ideas among the leaders of the trade unions, which will be of greater advantage to their constituents than the destructive and ponderous methods of the extremists, who cannot, or will not, see that tactics which injure trade cannot produce an atom of benefit for their members, but, on the contrary, must seriously restrict the scope of employment. The miners' strike has also shown the leaders that, in making demands, the economic circumstances of an industry must be taken into account by the trade unions, as well as by employers. Like other people, trade union leaders live and learn. The consideration by the "T.U.C." of the whole subject of the general strike has been deferred until after a conference of the Executives of the whole of the unions can be held.

The Unemployed.

The number of persons on the registers of employment exchanges in Great Britain on Aug. 30 was 1,549,800. This was 9138 less than the preceding week, but 195,498 more than a year ago. The total of 1,549,800 is exclusive of persons who ceased work in the coal-mining industry on account of the dispute.

PERSONAL.

From the Secretary of the Department of Scientific and Industrial Research, we learn that Prof. VERNON HERBERT BLACKMAN, D.Sc., F.R.S., Prof. FREDERICK GEORGE DONNAN, C.B.E., D.Sc., LL.D., F.R.S., and Prof. FREDERICK ALEXANDER LINDEMANN, Ph.D., F.R.S., have been appointed, by Order in Council dated Aug. 20, to be members of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research, in place of members who have retired on the completion of their terms of office.

On Friday, Sept. 10, Mr. H. D. Madden, M.Inst.C.E., the Engineer and Manager of the Cardiff Gas Light and Coke Company, made, on behalf of the staff, a presentation of a cabin trunk to Mr. L. V. JONES, who is leaving to take up the position of Assistant Distribution Engineer to the gas undertaking at Rio de Janeiro. Mr. R. J. Auckland, F.C.I.S., Secretary of the Company, presided. Mr. Jones, who is 24 years of age, commenced his service with the Company 7½ years ago, as an apprentice, and has attained the position of Technical Assistant on Distribution. Mr. Madden, in making the presentation, said he regretted the fact that Mr. Jones was departing, and congratulated him on securing so important a position. He added that it was Mr. Jones' diligence and perseverance during his apprenticeship and at the Cardiff Technical College which had fitted him for the position he was taking up. Mr. Jones suitably responded. It is interesting that Mr. C. H. Carder, the Chief Gas Engineer of the Brazilian Tramway, Light, and Power Company, Rio de Janeiro, who are Mr. Jones' new employers, was at one time Assistant to Mr. Madden at Cardiff.

Mr. W. J. LIBERTY (Public Lighting Superintendent of the City of London, and Secretary of the Institution of Public Lighting Engineers) has been co-opted a member of the National "Safety First" Association Council and of the Public Safety Committee.

OBITUARY.

We regret to learn of the death, at the age of 41, of Dr. H. TEMPLER DEPREE, only son of Mr. F. Templer Depree, Chairman of Messrs Willey & Co., Ltd., of Exeter, and of the Devon Gas Association, and a former Chairman of the Council of the Society of British Gas Industries.

ELECTRICITY SUPPLY MEMORANDA.

WHEN the Electricity Supply Bill, as amended in Standing Committee, is brought forward in the House of Commons for consideration on the reassembling of Parliament in the second week in November, attempts will be made to introduce new clauses (or clauses that were unsuccessful in Committee), and to make other modifications. There is an earnest desire in the industry to obtain general powers for joint electricity authorities and local authorities to sell wiring and fittings; and the clause which was refused by the Government in Standing Committee, on the ground that it would be more appropriate to deal with it when (say) the General Electric Acts are undergoing revision and consolidation, is to be submitted for the verdict of the House. A clause is also tabled providing for the Minister of Transport preparing a scheme for the periodical appointment of the Central Electricity Board, the scheme to be as nearly analogous as practicable to the statutory provisions relating to the appointment of members of the Mersey Docks and Harbour Board. The proposers of this clause will also seek for the scheme being embodied by the Minister of Transport in an Order which shall be laid before each House, and shall not come into force unless and until it is approved, either with or without modifications, by a resolution of each House. An endeavour is to be made further to clip the wings of the Electricity Commissioners in respect of generating stations, transmission lines, and arrangements for mutual assistance, by ensuring that they shall consult with the Central Board; and consent, approval, or making any requirement is to be as the Board may agree. The Electricity Commissioners may not like to be shorn of more power than has already occurred. A stronger appeal tribunal will also be sought, together with an enlargement of the right of appeal from the decisions of the Commissioners. Another important suggestion is that, by Order of His Majesty in Council, all electrical powers and duties transferred from the Board of Trade to the Minister of Transport shall revert to the former; also all powers and duties conferred upon the Electricity Commissioners; and thereafter all references in Acts, Orders, regulations, or enactments are to be construed as referring to the Board of Trade. We feel that we should be pretty safe in guessing what will be the fate of these proposals; as also of several modifications and deletions which the Government will propose. There will no doubt be rejection of the former; and, through voting power, acceptance of the latter. The Bill as amended in Standing Committee runs great risk of having some of its features further changed before the House of Commons has finished with it. Then there will be the House of Lords.

The Bill—More Modifications Proposed.

Eltham Revolt.

The tenants on the housing estate at Eltham do not intend to be kept in chains by the Woolwich Borough Council in respect of the heating agent they use for cooking purposes. This has been the subject of paragraphs in the "Memoranda" the last two weeks. Since then the "Daily Express" has made reference to the matter. Our contemporary says the tenants have adopted as their war-cry: "Freedom to Use either Gas or Electricity in our Homes;" and they intend to carry on a vigorous campaign to realize the liberty they desire. It appears from the statement in our contemporary that there has been a deputation to the Council to ask them to alter the tenants' agreements. The spokesman (Mr. B. A. G. Beaten) on the occasion, stated that the tenants pay a flat rate of 2d. per unit for both lighting and cooking, and that the average weekly bill for electricity in the houses amount to between 10s. and 12s. Mr. Beaten says they have proof that a dinner for six people can be cooked by gas for 1d., while a similar dinner cooked on the electric stoves costs at least 6d. The charge of 2d. per unit sounds cheap. It would be cheap for lighting only; but electricity for cooking purposes, he asserts, is so expensive, even at 2d. per unit, that nearly 100 householders have bought oil stoves by which to cook their meals. It is announced that a protest meeting is to be held at Eltham to-day. There is no question that the tenants intend to be as insistent upon regaining their liberty as the Council are that they shall continue to patronize the municipal electricity undertaking. Who will win?

Reduced Revenue per Unit.

A comparative table has been published by the Preston Corporation Electricity Department which shows the consumption of current by some fifty consumers before and after what is termed in that town the "electric home system of charging." In the year before the introduction of the home system, the units consumed by the fifty consumers amounted to 15,661, with a revenue of £477 11s. 5d., or an average of 7·3d. per unit. Under the home system of charging, the same consumers used 87,400 units, which produced a revenue of £632 4s. 10d., or an average of 1·73d. per unit. The increase in units was 460 p.ct., but in total revenue only 32 p.ct. In other words 71,739 more units were sold, and yielded only an additional £154 13s. 4d. of revenue, or 0·51d. per unit. It seems from these figures that the greater consumption is out of all proportion to the extra revenue obtained; and it is a question whether the Department is actually better off financially. We are also wondering what would happen to the department if all the consumers went on to the home service, and the average revenue was reduced to 1·73d., or below, per unit. Of course, there are large variations between the average price paid under the system by different consumers. We see from the table that one consumer under the new system paid an average of 4·049d. per unit, while another paid 1·183d. per unit. The last-mentioned one consumed 4576 units. But the consumer immediately preceding him used 5828 units, and paid 1·229d. per unit. It would be interesting to learn why the latter had to pay more per unit. We should also like to know at what average price per unit such consumers become non-productive for the undertaking—including the average of all charges. According to the "Electrical Times" tables, the total working costs of Preston last year totalled 1·89d. per unit, excluding interest and sinking fund.

Increased Fuel Costs.

Electricity undertakings are feeling the increased cost of fuel, although it only represents a fraction of the total costs in electricity supply. It is stated, for example, that the extra cost of fuel to the Leeds Corporation Electricity Department has been, since the miners' strike began, between £40,000 and £50,000; and the cost of fuel per KW.-H generated has risen from 0·2d. to 0·7d. The charges to all classes of consumers are to be advanced 0·25d. per KW.-H. during the Oct.-Dec. quarter. The Luton Electricity Department are paying for coal 46s. 6d. per ton, against 21s., and so a temporary 10 p.ct. advance is to be made in the charges for current. From Oldham the report comes that the increase in the cost of production, due to the high price of coal, is 0·5d. per KW.-H. In consequence, a reduction of tariffs has been postponed. At Bolton, the ordinary rate of 4¾d. per KW.-H. for lighting is to be advanced by ¼d.; and for power by ½d. The Worksop District Council are going to cancel on the 1st prox. the reductions in the prices of electricity which came into force on April 1 last, with the exception of the business tariff, which will remain at 1d. per KW.-H. From Liverpool, we learn that coal from abroad is costing the Electricity Department 25s. or 26s. per ton above recent normal prices, and, notwithstanding, the coal is of a lower quality than that generally used. The Department has purchased 40,000 tons of coal from overseas at an extra cost of £50,000. The Peterborough Corporation Electricity Department states that, although there was a record output in July, there was a net deficit of £2251 due to the cost of coal. Several undertakings have adapted their boilers for oil fuel. The Ayrshire Electricity Board have done so; and they announce that the existing coal clause, which is applicable to all energy used for power purposes, is now replaced by a fuel clause. The charges for power purposes will henceforth be based on the average price of coal and oil fuel delivered at the Board's power stations. In addition to the increased price of coal, its poorer quality affects the cost of steam-raising through the reduction of efficiency. When the data of the Electricity Commissioners are published for this year, it will probably be found that the quality of the coal now being used will have made a difference to the average pounds expended per unit of production. If the returns were separated, so as to show the difference in consumption per unit during July to the end of the strike, compared with the first four months of the year, the figures would be illuminating.

Naphthalene Stoppages and Electrical Failures.

It has come to the knowledge of the "Electrical Times" that during periods of extreme hot or cold weather, gas service-pipes are liable to become stopped through the deposition of naphthalene; and it refers to a notice issued by a gas company that consumers observing any defect in the gas supply should communicate immediately with the manager at the gas-works. Our contemporary thinks the notice would be greatly improved by the alteration of one word—that is by changing "gas" to "electricity" before "works." It is true that the manager of the electricity works can guarantee absolute immunity from naphthalene troubles; but what he cannot do is to guarantee immunity from breakdowns of the electricity supply, which are not only far more frequent than breakdowns of gas supply, but may affect simultaneously all the consumers in a supply area, or a section of them, or individuals, depending upon whether the mishap occurs at the generating station, on the district, or within the premises of the consumer. Naphthalene troubles (which, during the past decade or so, have been reduced enormously in well-regulated gas-supply systems) only affect individual consumers. The reminder of the frailties of electricity may induce our contemporary to reconsider its suggestion of the alteration of a word in the notice which drew from it a comment of a not conspicuously intelligent order.

DANGER OF EARTH CURRENTS ON GAS-WORKS.

By H. C. WIDLAKE, A.M.I.E.E., of the Plymouth and Stonehouse Gas Light and Coke Company.

About five years ago it was my privilege to contribute an article on the above subject to the "JOURNAL" (July 7, 1920, p. 26). At that time the points raised were entirely the fruits of personal experience and observation, and were in no way based upon or supplemented by any outside information. It was, indeed, suggested from more than one source that I was chasing a myth, or at any rate that the possibilities outlined as to the damage which could be caused to gas apparatus by stray currents were so extremely remote as to be not worth serious consideration.

Since then, however, I have acquired a considerable amount of information regarding what may be termed unaccounted-for troubles on gas-works—or in other words, troubles which have developed, and have been put right, but for the occurrence of which no satisfactory explanation has ever been forthcoming.

In no case coming to my knowledge has it been admitted that stray currents were the responsible agents, yet in each case the electrical conditions pertaining to that particular plant were such as could easily give rise to uncontrolled and undetected earth currents.

As regards the plant for which I am responsible, the experience of the past five years has, happily, not added to my knowledge of damage caused in this manner; but what it has done has been to confirm—if, indeed, any confirmation was needed—the views previously expressed that in many gas undertakings rapid deterioration of valuable plant is taking place in so insidious a manner as not to give rise in the minds of the responsible engineering officials to the slightest suspicion of the real state of affairs.

The immunity which we at Plymouth enjoy from this form of trouble is entirely due to the fact that we are fully alive to the conditions under which it may arise, and are hence in a position to detect the first signs of trouble in this respect long before an incipient fault can develop into an agent of destruction

A SUBJECT DEMANDING GREATER ATTENTION.

I do not wish to pose as an alarmist, but I do suggest that the time is long overdue when this matter should be thoroughly ventilated, and steps taken to put an end to a disease which is literally eating into the profits of many an undertaking. The only manner in which this can be accomplished is to give wide publicity to the circumstances in which danger and damage by electrolytic action can arise, and to hope that the subject will be considered of sufficient importance to warrant its discussion at District Association meetings of engineers, where experiences can be interchanged and much valuable assistance imparted to those who do not happen to be conversant with this particular phase attendant upon the use of electrical power.

SUPERVISION A VITAL FACTOR.

The risks of trouble due to the deterioration of plant, structures, and mains on the works caused by the improper passage of electric currents commences from the day electrical machinery is installed for the operation of the various units of works plant; and the degree of immunity or otherwise which will be experienced in this particular connection will depend entirely upon the nature of the supervision under which the plant is run.

I have repeatedly urged in various contributions to these pages the folly of incurring considerable expenditure on electric power plant and then leaving it to the tender mercies of handy men, or third-rate wiremen, termed by courtesy electricians.

The high hopes of parents desirous of providing a brilliant future for their sons has resulted in innumerable small premiums being handed over to mushroom concerns who possess neither the technical ability nor the organization necessary to give a lad a proper electrical training; and the result is that to-day the electrical labour market is flooded with inexperienced youths whose chief stock-in-trade is an optimistic readiness to run, or rather to ruin, any plant over which a misguided owner is foolish enough to give them control.

It is this matter of incompetent supervision which lies at the root of the troubles forming the subject of this article. The best insurance which the user of an electric power plant can effect is to engage a good man to run it for him; and if the plant is too small to warrant the employment of such a man, it should be periodically inspected by an engineer of repute.

INSIDIOUS COMMENCEMENT OF THE TROUBLE.

It is one thing to keep a plant running in an apparently satisfactory manner, and quite another to keep it free from those faults which constitute a source of danger to adjacent plant. A point which should be borne in mind is that the most rapid electrolytic deterioration of mains and plant may be taking place under one's nose, without the electrical plant from which all the damage springs faltering in its stride, or working in any other than what is apparently a thoroughly satisfactory manner. In other words, the birth of an earth current is not necessarily accompanied by any of the pyrotechnic displays, blowing of fuses, and falling of circuit breakers, which one usually associates with the occurrence of an electrical fault.

I propose to take the case of a works served by a 220 volt, direct current, double-pole system—*i.e.*, a system in which the positive and negative sides are efficiently insulated from contact with earth—and to show the conditions under which electrolytic trouble may develop and proceed unchecked and unobserved.

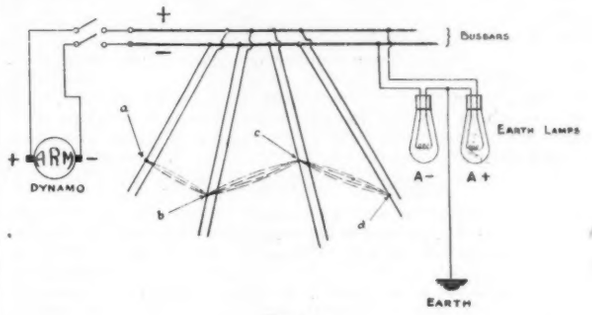


Fig. 1.

In fig. 1 an ordinary double-pole system is shown diagrammatically. A dynamo supplies current to a pair of bus bars from which feeders are run to various portions of the works. This system is free from any legitimate contact with earth, except at one point—namely, the earth lamps A + and A −; and these play such an important part in the argument as to warrant the prominence given them in the diagram. They consist of two 220-volt lamps connected in series across the busbars, the centre point between the lamps being connected to a good earth such as an adjacent water pipe. So long as this system is well insulated on both limbs, the positive side will be maintained at a potential of 110 volts above earth potential, and the negative side at a potential of 110 volts below earth potential, and the two earth lamps will both glow with equal brilliancy. If, instead of lamps, a pair of voltmeters were installed, each meter would read 110 volts.

Now let it be assumed that a fault to earth occurs at the point marked *a* on one of the negative feeders. The negative side of the system will immediately fall to earth potential, while the potential between the positive side and earth will be doubled. If the system as a whole is in fairly good order, everything will run on as before; but if it is in bad order, the probability is that the doubled pressure between the positive side and earth will find out a number of weak places, causing burn-outs. Assuming the former state, all that will happen on the occurrence of the fault will be that lamp A− will cease to glow, while lamp A+ will light up with twice its usual brilliancy.

If instead of lamps voltmeters were installed, the one on the negative side would fall to zero, and the other would read 220 volts. Thus the balance of the entire system will be affected by one fault occurring, not necessarily on the feeder line as assumed, but anywhere between the negative brush of the dynamo and the negative side of any of the works motors or lights. Up to now, though the system is earthed by one fault, no earth current is actually flowing, as, before this can happen, there must be two points of differing potential between which a current can flow.

Now let it be assumed that a second fault to earth develops on the same side of the system, at (say) point *b*. A flow of current, shown by dotted lines, will immediately take place between the two points *a* and *b*, its magnitude being determined by the load on the feeders on which the faults lie, and the respective distances of the faults from the source of supply.

SMALL INDICATION OF FAULTS.

Thus two faults have occurred, both on the same side of the system. But note this—no fuse has blown, no breaker has fallen, the dynamo has not faltered in its stride, the main ammeter has not risen from its normal position by as much as a milliamp. All that has happened is that one lamp on the switchboard has gone out, and another has lit up with twice its normal brilliancy. Yet the conditions under which the plant works have changed altogether. Immunity from electrolytic troubles no longer exists. Two faults have developed, and between them a current is flowing causing rapid deterioration to any metallic apparatus, such as plant and mains, which may lie in its track, and so assist it in its search for the path of least resistance.

Now let it be assumed that two more faults develop to earth on the negative side at (say) the points marked *c* and *d*, making a total of four faults all on the same side of the system. Earth currents, shown by dotted lines, are freely flowing between these four points, doing incalculable damage to valuable ap-

paratus; yet the electrical plant continues to run sweetly, and by its general behaviour inspiring a sense of absolute security.

Only when the first fault occurred at *a* did one of the earth lamps go out and the other glow with increased brilliancy. If, instead of four faults, forty faults had developed, nothing further would have happened so far as any element of warning was concerned.

If the earth lamps are allowed to fall into a state of disrepair, or, being in order, their warning is ignored, we lose at once the simplest means of keeping our fingers on the pulse of the plant. Yet this frequently happens, and the man in charge of the plant imagines that, because no fuse has blown or no breaker has fallen, everything is as it should be.

It may very naturally be argued that earth lamps do not constitute the only form of protection, and that other forms of protective gear could be installed to give warning of a fault to earth in an unmistakable manner which could not be ignored. This is admitted; but even a most elaborate system of protection does not solve the problem of the incompetent attendant. A man to whom the functioning of earth lamps conveys no message of warning is not likely to maintain any protective system in an efficient condition.

FAULTS ON THE POSITIVE SIDE.

So far I have only dealt with faults developing on the negative side of the system, but the argument I have set out applies with equal force to the positive side. One fault to earth or hundreds of faults to earth could develop on one side (either positive or negative) of a double-pole system; and so long as the other side was free from faults, no difference would be noticed in the running of the plant, and only the functioning of the earth lamps on the occurrence of the first fault would indicate the existence of dangerous conditions.

Of course, a fault developing on the positive side of a system whose negative side was already earthed would cause a shutdown; but I have endeavoured to show how a badly-maintained system may be earthed by a number of faults on one side without the actual running of the plant being affected, and further that the presence of two faults to earth on the same side may give rise to the flow of a destructive current. I have frequently met cases in double pole working where the occurrence of a fault on one side has caused a feeder fuse to blow, and the electrician in charge has located that fault, remedied it, and declared everything "O.K.," never realizing that he was leaving an undiscovered fault or faults on the other side.

THE SINGLE-POLE SYSTEM.

I now come to the consideration of a system which is very commonly found on gas undertakings—*i.e.*, the single-pole system having the negative side earthed by the track and structure of a monorail telpher.

Occasionally this is found in what can only be described as a hybrid form. I allude to a double-pole system with which is associated a monorail single-pole telpherage. Under proper supervision it would be at once recognized that the introduction of a single-pole telphe.age into a works must necessitate the alteration of the works double-pole electrical power system to single-pole working and the consequent abolition of all main and feeder switches and fuses on the negative side. This requirement is, unfortunately, not always recognized; and one frequently comes across plants having full double-pole switching and protective arrangements, and yet with the negative side put to earth each time a double-pole switch feeding the telpher circuit is closed. In this way the potential of the positive side relative to earth potential is being frequently doubled and halved, while the potential of the negative side relative to earth potential is as frequently altered from zero to half the supply voltage. This is not only contrary to Board of Trade requirements, but imposes a strain on the insulation of the entire plant each time the telpher is switched in or out.

Where a single-pole telpherage is installed, and operated from an existing works double-pole system, the fact must be faced that the plant can be no longer regarded as a double-pole installation, and must be altered to conform to the regulations governing single-pole working.

The telpher track and structure must be permanently connected to the negative bus bar, and no interruptive device such as a switch or a fuse can be permitted on the negative side of the dynamo or feeder system. Linked double-pole switches may continue to be used on individual motors.

A single-pole system has its advantages, among the chief of which is the fact that, owing to the negative side being permanently maintained at earth potential, it is impossible for a fault on one side of the system to result in the doubling of the pressure between the positive side and earth. With such a system the telpher track structure must be regarded as a huge earth plate offering an easy alternative path for currents leaking from some other portion of the negative network. Earth lamps, in the sense to which I have previously alluded to them, cannot be employed on a single-pole system, and so other means have to be provided to detect irregular conditions.

EARTH CURRENTS WITH SINGLE-POLE SYSTEMS.

Assuming that the telpher track is electrically continuous (I shall touch upon the question of efficient bonding in a later portion of this article), we will now proceed to consider the conditions under which destructive earth currents can exist in connection with a single-pole system. In an installation in which the telpher constitutes the only load on the generating plant, or, alternatively, one in which the telpher is isolated on a separate dynamo, no danger from earth currents need be feared, as with a well-bonded track there is little inducement for the return currents to stray from the low resistance path provided for their passage. Such conditions, however, rarely pertain on a gas-works, where the electric plant is used for a host of purposes other than telpher driving, and the danger from earth currents lies in the passage to the telpher track of currents from faulty points on the negative side of the supply system.

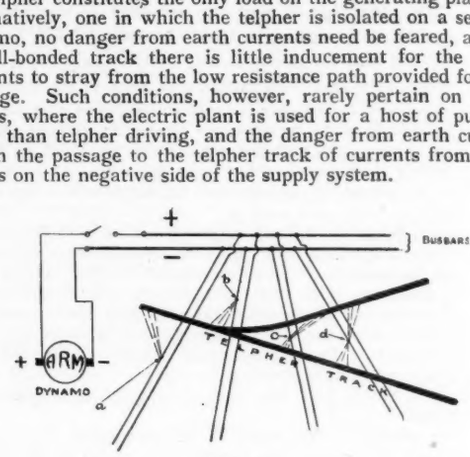


Fig. 2.

Fig. 2 shows in diagrammatic form a single-pole works supply system. Feeders radiate from the bus bars to various points on the works; and a telpher track permanently connected to the negative bus bar cuts through the works site. It will be noticed that in this diagram no earth lamps are shown, since (as has been previously explained) this method of fault indication is useless with a single-pole system.

When considering the double-pole system, it was pointed out that two faults at points of differing potential must occur on one side of such a system before a flow of current through the ground could be established. With a single-pole system, however, it must be borne in mind that the negative side is legitimately and pemanently earthed by the telpher track structure, so that in this case a single fault developing on the negative side of the system is sufficient to establish a flow of current between the point of the fault and the telpher track. Let it be assumed that such a fault occurs at point *a* on one of the negative feeder lines. A flow of current as shown by dotted lines will at once take place between point *a* and the nearest portion of the telpher track, causing electrolytic damage to any apparatus which may lie in its path and facilitate its passage.

As in the case of the double-pole system, no faltering in the working of the plant or blowing of fuses will mark this change of conditions. As a matter of fact, the negative network may be earthed at many points, and the works site simply creeping with earth currents, without the actual working of the plant being in any way affected. This state of affairs is shown by faults marked *b*, *c*, and *d* in fig. 2; the paths taken by the currents flowing from the positions of the four faults to the nearest portions of the telpher track being shown by dotted lines.

From the above, it will be noted that both as regards double and single pole working destructive earth currents can come into existence and cause continuous damage to valuable apparatus without affecting the actual working of the plant. In the case of the single-pole system, the risks of this happening are greater, as not only do we miss the warning of earth lamps, but the presence of the telpher track structure running through the heart of the works and forming a huge earth plate offers an easy objective to any currents arising from faulty insulation of any portion of the supply system.

I have endeavoured by repetition to show the insidious nature of this evil, and how it can easily be prevalent on a plant that year in and year out runs in a manner which, superficially, leaves nothing to be desired.

It will be clear from the foregoing remarks that, although the presence of a single-pole telpherage operated from the general supply increases the risks from damage by earth currents, there is no justification for the assumption that a works served by a double-pole system will be immune in this connection. Neither is there any justification for installing a double-pole telpherage in order to retain the advantages of double-pole working. The single-pole telpherage possesses the decided advantage that the number of trolley wire insulators (which are all potential sources of trouble, particularly in bad weather) is exactly one-half that which would be required for a double-pole installation, while the greater degree of simplicity in trolley wire fittings at track switches is too obvious to need much comment.

REMEDIES.

Having indicated the conditions under which expensive plant can be damaged by earth currents from faults on adjacent power cables and plant, irrespective of the nature of the electrical system in use, I will now endeavour to show the best methods by which immunity from this evil can be attained. The first essential is that the engineering official responsible for the maintenance of the electrical plant should be thoroughly familiar

with the conditions under which a combination of faults to earth on one side of a system can result in a flow of current which is capable of causing damage to any metallic structure lying in its path. The most elaborate protective devices are useless in the hands of a man who is not conversant with the conditions leading up to this trouble. The second important point is that when the plant includes a single-pole telpherage system, an efficient method of rail bonding should be insisted upon. The fact that the rails are all bolted to what is practically a continuous running joist does necessarily imply that each length of rail is in proper electrical connection with its neighbour; and the rails themselves should be properly bonded with riveted copper bonds in exactly the same manner as the rails of a street tramway system are connected across the fishplates.

Track Switches.

In this connection particular attention should be paid to those portions of the system where track switches are introduced; and such switches should be electrically bridged by long copper bonds, with the object of insuring electrical continuity irrespective of the position which the tongue of the track switch may occupy. If the above precautions are not taken, a portion of the return current may very easily be shunted down the track legs at points of poor electrical connection, and will use the ground as a return circuit in parallel with the track, to the detriment of adjacent apparatus. Where more than one telpherage system supplied from the same power source is installed, the respective tracks should be electrically connected by copper conductors of ample capacity.

Where a single-pole telpherage is installed on a works which has hitherto been served by a double-pole electrical supply system, there are two courses open to the management—namely, either to let the existing system of supply remain unaltered, and to instal motor generators for the operation of the telpherage, or to take in hand the immediate alteration of the works supply system from double to single-pole working.

Where a works is already served by a fair-sized double-pole system, there is a strong argument in favour of the use of motor generators. The advantages and simplicity of the single-pole telpherage will be available without the necessity of altering the entire works service. If this latter system is giving satisfaction, and the works staff are thoroughly familiar with its working, it is not worth while to alter its entire characteristics in order to accommodate the newcomer. The installation of motor generators in duplicate may add another £300 to £400 to the cost of the job, but on a large works this expenditure is to be preferred to the costly and laborious task of altering the power plant to single-pole working, while the advantages of a single-pole telpherage are worth purchasing at many times that figure.

With the telpher machines isolated on the dynamo ends of the motor generators, the presence of the earthed telpher track running through the heart of the works can offer no path for the passage of leakage currents arising from faults on the main works supply system.

This consideration furnishes the strongest argument for double-pole working, as a single fault to earth on such a system merely gives an indication of its existence, and cannot result in a failure of supply unless that warning is ignored, and the original single fault becomes supplemented by a second fault on the other side of the system. On the other hand, the single-pole system with one side permanently earthed requires only one fault, sudden and unheralded, on the positive side to bring a section of the works to a standstill. Thus it may be taken for granted that the double-pole is the safer system for a works making a widespread use of electric power. The foregoing remarks apply irrespective of whether a telpherage is included in the load.

Isolation of the Telpherage.

Now, it stands to reason that an outdoor telpher system, whether single pole or double pole, subject to climatic conditions as well as the deleterious effects of heat, steam, and sulphurous fumes, cannot compare in reliability (from the point of view of insulation) with the other portions of the supply network; and the chance is much greater of faults developing on the telpherage than on the other circuits. For these reasons, the telpherage may always be regarded as the weakest link in the system; and this alone constitutes a strong argument for its isolation on a separate generator. Given this isolation, there is no advantage to be gained by working it double pole, and the simplicity of single-pole working (so far as telphers are concerned) may be enjoyed to the full without subjecting the remainder of the plant to the undoubted drawback of this system.

From the foregoing, it is obvious that the best protection against earth currents lies in the choice of a system which by its nature interposes the maximum number of lines of defence between safe and unsafe conditions of working. This requirement is met by the employment of the double-pole system, in which it is essential that two faults to earth must develop on one side before a flow of current through the ground can be established, while it also lends itself to the use of a simple method of fault detection which will give adequate warning of a fault immediately it occurs.

In reviewing the relative merits of the double and single pole systems, many arguments for and against each method can be advanced; but the main points of consideration should be:

(*a*) The maintained safety of works apparatus and plant lying under the ground line.
(*b*) The literal continuity of the electric supply on the works.

As to this latter point, it will be recognized that a great change has come over electric power plant as employed on gas-works during the past few years. When electric power was used simply for the operation of stoking machines, telphers, and handling plants, a failure of current due to (say) a fault on a feeder line was attended by inconvenience and delay certainly, but by no element of danger. To-day, however, when so many works use electricity for driving oil gas blast fans, exhausters, and for boosting gas into the district at times of maximum demand, it is essential that the plant should run year in and year out with the most literal degree of continuity.

In the case of an existing plant in which a single-pole telpher forms part of the load, and the plant is installed single-pole throughout, a certain degree of protection against earth currents can be attained by installing a pair of edgewise ammeters on the circuit feeding the telpher—one on the positive feeder, and one on the connection between the negative bus bar and the telpher track. When the telpher is working, these meters will rise and fall in synchronism so long as the other portions of the supply feeders are in good order. Should a fault occur on a negative feeder, its existence will be indicated by the negative meter showing a reading when the telpher is not working; while when it is working, the negative meter will be always reading in advance of the meter in the positive pole of the circuit.

The author desires to express his thanks to Mr. P. S. Hoyte, the Chief Engineer of the Plymouth and Stonehouse Gas Light and Coke Company, by whose courteous permission he is enabled to publish the results of his investigations.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

Sept. 6-18.—Smoke Abatement Exhibition, at Birmingham.

Sept. 16.—Midland Association of Gas Engineers and Managers.—Official visit to the Smoke Abatement Exhibition, Birmingham.

Sept. 18.—Manchester and District Junior Gas Association.—Visit to Morecambe.

Sept. 20.—Evening Star Lodge.—Emergency Meeting.

Oct. 5.—Wales and Monmouthshire District Institution of Gas Engineers and Managers.—Meeting at Porthcawl (provisionally arranged).

Oct. 25, 26, 27.—British Commercial Gas Association.—Annual conference at Newcastle-upon-Tyne.

Feb. 16.—"B.C.G.A." Midland District Conference.

Institution of Gas Engineers.

Sept. 20.—Council meeting.

Sept. 21-23.—Postponed Annual Meeting.

Manchester and District Junior Gas Association.—Arrangements have been made for a visit to Morecambe next Saturday afternoon, Sept. 18; this being the annual ladies' day. The visitors will meet at the gas-works, Moss Lane, and after the inspection will assemble for tea in the Winter Gardens, as the guests of the Morecambe Gas Committee.

Radiation from Luminous Flames.—In a contribution to the Division of Gas and Fuel Chemistry of the American Chemical Society, R. T. Haslam and M. W. Boyer state that radiation from luminous flames of town gas, methane, ethylene, and acetylene has been studied by allowing the radiation from a small flame to fall on a thermopile at such a distance from the flame that it could be considered as a point-source. The radiation from luminous flames of town gas, methane, and ethylene, amounts to 9·2 p.ct., 8 p.ct., and 10·65 p.ct. of the total heat of combustion respectively. These values, however, are considered to be low, because of the difficulty of obtaining complete luminosity in such a small flame. Acetylene gave a truly luminous flame, the radiation from which amounted to 28·2 p.ct. of the total heat of combustion, as compared with 6·9 p.ct. from a similar non-luminous acetylene flame. These data demonstrate the order of magnitude of radiation from luminous flames, and indicate that it should hold a position of greater importance among the methods of heat transfer than has been hitherto recognized by the majority of engineers.

WOODALL-DUCKHAM CONTINUOUS VERTICAL RETORTS AT THE PROVAN WORKS, GLASGOW.

CARBONIZATION OF 1,500,000 TONS OF COAL.

"There is a tide in the affairs of men which, taken at the flood, leads on to fortune."

It seems but a few months ago that we were describing in the columns of the "JOURNAL" the large installation of Woodall-Duckham vertical retorts which had been erected at the Provan Works of the Glasgow Corporation Gas Department. But, looking back, we find it was as long ago as the last day of November, 1921, that gas making was started in them. To-day, after less than five years, the installation has carbonized upwards of 1,500,000 tons of coal. The Provan Gas-Works illustrates the great strides that gas engineering has made during the past twenty years. It constitutes by its design and magnitude one of the outstanding achievements of modern gas engineering.

The carbonizing plant consists of 192 Woodall-Duckham continuous vertical retorts, disposed in eight benches of 24 retorts, each retort having a carbonizing capacity of about 7 tons per day—thus giving a total capacity of 1356 tons of coal per day. At the time of placing the order, this was the largest single contract ever given out for continuous vertical retorts; and there may have been in the minds of some engineers a feeling that Glasgow was entering upon a big adventure in putting in such a large plant. The results show that the careful investigation which the authorities made before placing the contract was well founded, and that their foresight in taking advantage of the progress in engineering design has proved, technically and commercially, a big success.

GUARANTEES EXCEEDED.

The carbonizing plant was guaranteed to deal with 1356 tons of coal per 24 hours; and the yield of gas per retort was to vary from 88,000 to 100,000 c.ft. according to the quality of the coal and the thermal value of the gas to be made. The total guaranteed gas-producing capacity, therefore, varied between 17,000,000 and 19,250,000 c.ft. per 24 hours. The output of the plant has exceeded the guarantees put forward by the contractors; and the maximum 24-hour make has reached the figure of 20,492,000 c.ft. of 476 B.Th.U. gas, even with the normal number of retorts under scurfing.

COAL QUALITY AND COMPARATIVE RESULTS.

The results obtained at the Provan plant have been highly satisfactory, taking into consideration the low average quality of the coals carbonized. The ultimate requirement of any plant is to produce cheap therms of the required calorific value; and the results cannot be assessed purely on a basis of therms per ton. The Glasgow Corporation prefer to buy coal from a large number of Scotch collieries, with the result that the quality varies considerably.

The years since the Glasgow vertical retort plant at Provan was started supply us with the following figures:

Year ended	C.Ft. of Gas per Ton.	B.Th.U. (gross) per C.Ft.	Therms per Ton.
May, 1923	13,948	489	68·34
,, 1924	14,082	484	68·24
,, 1925	14,882	477	71·13
,, 1926	14,447	475	68·6

In order to assess the value of these results, the most satisfactory way is to compare them with those obtained when gas of the same calorific value is made from horizontal retorts, diluted with water gas. The figures for mixed gas at the Tradeston Works for the similar period are as follows:

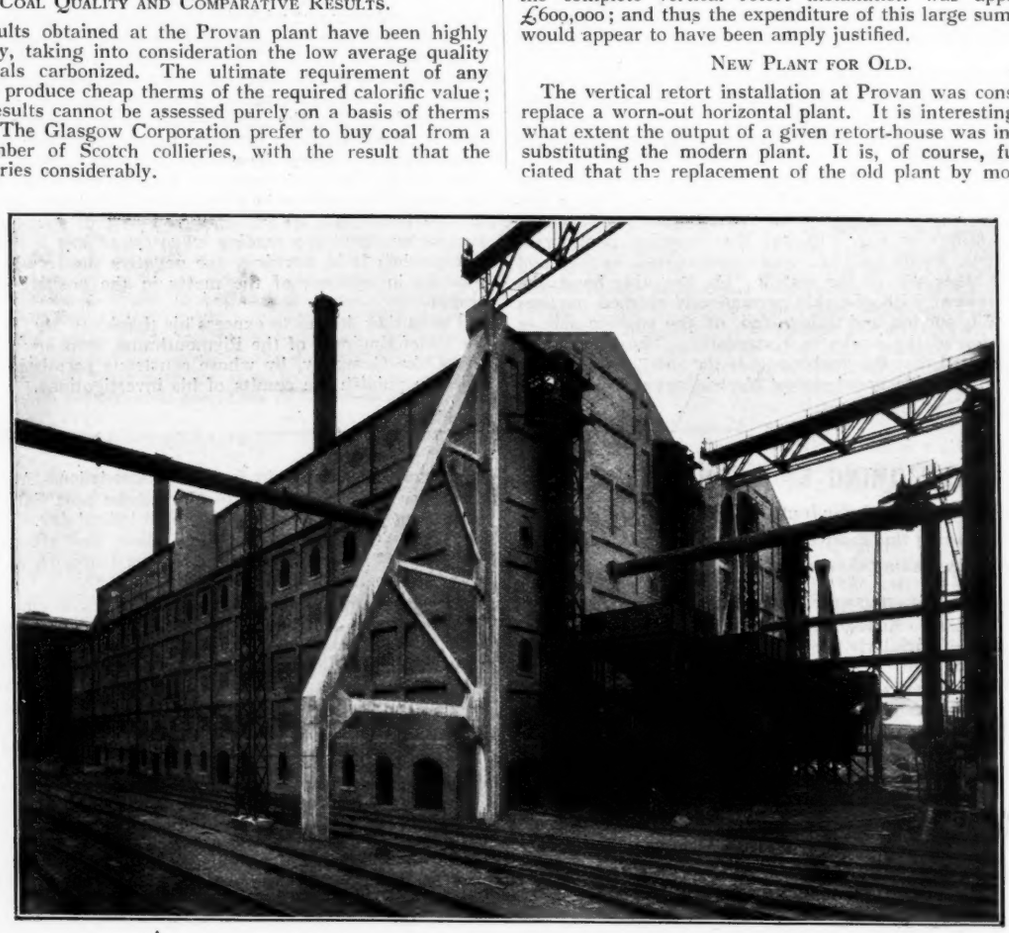
Year ended	C.Ft. of Gas per Ton.	B.Th.U. (gross) per C.Ft.	Therms per Ton, Coal Gas + B.W.G.
May, 1923	12,106	495	60·04
,, 1924	12,598	488	61·6
,, 1925	13,152	475	62·6
,, 1926	13,507	474	64·14

COST REDUCTION AND SAVING.

It will thus be seen that, when producing the same quality of gas, the vertical retort installation has during the past four years given an average of 11 p.ct. higher thermal yield than when the gas was made from horizontal retorts mixed with water gas. In addition to this higher yield, the operating costs are lower; and the figures at Glasgow show that the cost of gas into the holder when made on the vertical retort plant is 1s. per 1000 c.ft. cheaper than when making mixed gas (coal gas *plus* water gas). The importance of this reduction in cost will be seen when it is realized that over 21 thousand million c.ft. of gas have been made in the vertical retorts, representing, at 1s. per 1000 c.ft., a total saving of over £1,000,000. The cost of the complete vertical retort installation was approximately £600,000; and thus the expenditure of this large sum of money would appear to have been amply justified.

NEW PLANT FOR OLD.

The vertical retort installation at Provan was constructed to replace a worn-out horizontal plant. It is interesting to see to what extent the output of a given retort-house was increased by substituting the modern plant. It is, of course, fully appreciated that the replacement of the old plant by modern hori-



THE PROVAN "W.D." VERTICAL RETORT HOUSE.

zontal plant would have considerably increased the output of the house. By the installation of the vertical retort plant, 6,000,000 c.ft. per day more gas were obtained in the house from the same quantity of coal. The therms per man per day increased from 285 to 795. The retort-house area is also considerably less with the vertical retorts; the output of therms per square foot per day being double what it was on the plant that was scrapped.

It is learned that the installation has required very low expenditure on maintenance, and no repairs to the retorts have been necessary in the first five years' working. Congratulations to all concerned.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

Report of Proceedings at the Annual Meeting in Glasgow.

The Annual Meeting of the Association was held on Thursday, Sept. 2, in the Rankine Hall of the Institution of Engineers and Shipbuilders, Glasgow. Despite the temporary dislocation of the gas industry by the continuance of the coal strike, the attendance was well up to the average.

Mr. JOHN WILSON (Gas Engineer, Motherwell and Wishaw), the President, occupied the chair, and expressed his personal delight that so many members were with them that day, because he knew how difficult it was for some of their number to get away from their undertakings at the present time.

A CIVIC GREETING.

Provost ARCHIBALD (Motherwell and Wishaw) voiced his pleasure at again meeting the members. One of the chief reasons which had brought him to Glasgow was a desire to convey to the Association the greetings of the Motherwell and Wishaw Town Council, and that body's good wishes for the success of the annual gathering. Personally he felt it was only fitting that acknowledgment should be made at this meeting by one such as himself, who was a member of a local authority, of the difficulties which gas managers and gas managements had had to overtake during the past four months. Between the scarcity of coal and the indifferent quality of much of that fuel—some of it could scarcely be described as coal—the gas managers of the nation had their worries. The country ought to realize that the managers and other officials of the various gas undertakings had proved a great asset during a difficult time of fuel shortage. It was no exaggeration to say that the gas undertakings of the country had been the mainstay of the domestic fuel supply for the past four months. It was unfortunate that so many undertakings had had to increase the price of gas; but he looked forward to the period when normal conditions would be resumed and managers would once again continue their progressive rôle of adopting improved plant and applying the latest scientific methods of production, whereby they would be able, in course of time, to produce gas at prices quite unheard-of in the past. He had, on behalf of his colleagues in the Motherwell and Wishaw Town Council, to invite the members of the Association and their lady friends to the Motherwell Town Hall that evening; and he was hopeful that the reception and dance would prove a happy culmination to a successful session of the Association.

The PRESIDENT, on behalf of the members, acknowledged the kindness of Provost Archibald in coming among them and extending the invitation to visit Motherwell.

COUNCIL'S ANNUAL REPORT.

[See "JOURNAL" for Aug. 25, p. 419.]

The minutes of the previous meeting having been unanimously adopted without discussion,

The PRESIDENT suggested that the annual report of the Council and the statement of accounts might be taken as read. It would, he said, be noticed that the Council had unanimously recommended that Mr. Lawrence Hislop, of Uddingston, should be elected an Honorary Member. Mr. Hislop was an ex-President who had rendered distinguished service to the Association and the gas industry. He had been an outstanding figure in the gas profession, not only in Scotland, but elsewhere. In particular, he had done splendid pioneer work at Uddingston; and the least the members could do, in recognition of his services, was to invite him to become an honorary member. There was also reference to the Institution's Education Scheme. That ought to be thoroughly digested by all the members, because the success of the scheme meant the success of the gas industry in the future. It seemed to him that the scheme could not be carried out as it ought to be without finance; and it would be noticed that the National Gas Council had agreed to remit back a portion of the subscriptions they received from Scotland, so as to enable the various colleges to provide the necessary classes. As a Council, they were very glad indeed that this had been arranged satisfactorily. The Council of the Association were asking the members to pay out a sum up to £100 this year, in case the subscriptions to be remitted back did not arrive in time to provide the requisite classes for the coming winter. The proposal was that the money up to the figure stated should be made available to the various colleges as they required it.

Mr. DAVID VASS (Perth), in moving the adoption of the report and the acceptance of the accounts, thought the proposal of the Council with regard to Mr. Hislop would meet with the hearty agreement of the members. So far as the scheme for the education of juniors was concerned, he presumed this Advisory Committee would be a permanent one. If that were so, he considered it would be advisable, now they were at the opening of a session, that the Committee should circulate something in the way of information to the juniors. Many of the young men were working in the dark, and did not definitely know the lines of study which should be followed. He had to congratulate the Committee on the financial position. They were all pleased that the Benevolent Fund stood so high; and he supposed they would be looking round with a view to discovering some useful direction in which the money now accumulated would be of service. His own opinion was that something more might be done in the way of following-up cases where grants had been made.

Mr. WILLIAMSON (Forres) asked if the Council thought it wise to commit themselves to an expenditure of £100 from the general funds of the Association. If they disbursed a similar sum every year, they would soon bring the finances of the Association back to the position they were in ten years ago.

The PRESIDENT explained that the grants hitherto paid to the colleges had been sanctioned by the members of the Association. He added that he should like to dispel any misapprehension occasioned by the observations of Mr. Vass. When applications were made to the Benevolent Fund, and grants made, the Council followed each case up carefully. If members were interested in any particular application to the Benevolent Fund, they should not hesitate to bring it forward.

The report of the Council was adopted without further discussion.

NEW MEMBERS.

The SECRETARY (Mr. David Fulton, of Helensburgh) said that, in addition to the names which appeared in the annual report, the Council had scrutinized and approved applications for membership from the following: Associate—Mr. Robert Gray, Assistant Gas Engineer, Greenock Corporation. Extraordinary Members—Mr. James F. Henderson, of Messrs. D. A. Penman & Co., Ltd.; and Mr. Walter George Head, of Messrs. Humphreys & Glasgow, Ltd.

MR. HISLOP'S ACKNOWLEDGMENT.

Mr. LAWRENCE HISLOP thanked the Council and the members of the Association for the honour they had conferred upon him in electing him an Honorary Member. He had the interests of the Association at heart; and this interest would be maintained as long as he lived.

THE PRESIDENT'S ADDRESS.

The PRESIDENT thereafter delivered his address, which was published on p. 537 of the "JOURNAL" for Sept. 8.

VOTES OF THANKS.

Mr. JAMES BELL (Dumbarton), proposing a vote of thanks to the President, remarked that he had seen Mr. Wilson's coal assay apparatus at Motherwell. It could with advantage be installed in every gas-works laboratory.

Mr. H. H. GRACIE (Edinburgh) seconded the vote.

The PRESIDENT acknowledged the vote.

THE POSITION OF SMALL GAS UNDERTAKINGS—PRESENT AND FUTURE.

By LEWIS BAIN, of Cullen.

The gas supply industry in Scotland is characterized by the relatively large number of undertakings which can be classed as small. It is with regard to the position of such undertakings, in the matters of finance and service of gas supply to the public, that I desire to state my views. Much has been heard of late as to the stability of the gas industry in view of competition from electricity, but reference has been directed more definitely to the large company and municipal gas-works. Complete confidence has been expressed as to the present and future of gas. While the stability of the large undertaking is assured, it is my intention to demonstrate that the smaller, and indeed the very small, gas-works are in a similarly good position, provided that a policy of efficiency is maintained in the management. If the subject is viewed rightly, it will be found

that, with certain obvious exceptions—possibly areas where amalgamation with a large undertaking is the only wise policy—the small output of gas, and what will be considered a high price of gas, do not render the financial position of the small gas-works a difficult one; nor can the public as consumers of gas be said to be dealt with unfairly. What is meant is that, with efficient service—and this is the keynote, in my opinion—gas consumers in the small towns will be given a good return by an efficient service of gas supply, for lighting, heating, and cooking, and for small unit power requirements. In my experience during a number of years, in three separate areas of small population, where the consumption in each district is only about 7 million c.ft. per annum, satisfaction has been attained, and the gas supply put in a safe position.

The total number of gas-works in Scotland is 237. The small undertakings up to 30 million c.ft. output per annum number 154, or 64·97 p.ct. of the total, and are classed as follows:

Under 10 million c.ft.	86
Between 10 and 20 million c.ft.	51
Between 20 and 30 million c.ft.	17
Total	154

Of the total shown, a division of circumstances of position can be stated as follows:

(*a*) Undertakings situated near to large gas-works where absorption may be considered to advantage; (*b*) undertakings in groups, but distant from large gas-works, where joint working might result in improvement; (*c*) undertakings so geographically situated that they are isolated, and must therefore continue as small units.

The subject of absorption of small gas-works by the larger undertakings does not enter into my consideration on this occasion. It may be stated, however, that the instances where absorption has taken place are already numerous, and that necessity will, in the near future, bring about many more.

Grouping Undertakings.

As regards group absorption of a number of undertakings situated near to each other, and of similar size, this presents many difficulties because of local circumstances. There is, for example, the question of shareholders' capital to be considered, if it is to be preserved, or if the smaller undertaking is prepared to sell. If a sale is agreed upon, the purchase may result in an excess capital account, having in view a sum for goodwill. This may not, therefore, be the best solution. If the smaller works are obliged to spend a considerable sum for extensions, then perhaps a bulk supply would probably be the best bargain to make with the larger gas-works, better equipped with manufacturing plant, and where capital expenditure to meet the added demand would be relatively small. There would also be the expense of linking of mains. The question is purely a financial one, as regards capital account, administration, and works costs. The position of group undertakings, to my mind, is one to be encouraged, as it leads to co-ordination of working, if actual combination is impossible. In any case the situation is one which is worthy of the attention of parties whose works are situated comparatively near to one another.

As regards undertakings situated wide apart and too far distant for grouping or linking up with a large works, these are cases where working efficiency and good service to consumers are so very necessary. There are inherent difficulties to face, as, for example, railway dues on coal, which may rise as high as 10s. per ton There is also the marketing of residuals, particularly tar and liquor, which products may yield comparatively little income. In regard to the sale of tar, the loss may be lessened by co-operative sale, and this will be referred to later. The one residual which offers no disadvantage is coke, as the price can be fixed according to the local price of coal.

Electrical Competition.

That electricity has a great field of usefulness in a community cannot be denied; but, as has been well said, it cannot do everything, and it is not the only source of power. Some of its advocates not only take it for granted that everybody wants electricity for lighting (which is not true), but they also advise its general use for cooking and heating, without realizing the fact that, if any generating station obtained any substantial cooking and heating load at the price at which current would have to be supplied to bring it into reasonable relation to the cost of gas, that station would go bankrupt. Electricity cannot be supplied at a price that will both pay for its cost and compete with gas for heating, cooking, and hot water supply, because electricity in this country, like gas, is dependent on coal for its production. There is no means, nor ever can be, for obtaining from a unit of electricity more than 3¾ p.ct. of the heat obtainable from a therm of gas.

I have before me the case of a residential town of 1500 where electricity has been supplied for the past twenty years. Electric light is in use in all public buildings and in practically all the shops. The streets are electrically lighted, as also is a large proportion of private house property. The gas company, while it has actually experienced strong competition—and this over a long period—instead of having gone back with its sales of gas, is to-day able to show almost a 50 p.ct. advance in output. This particular case is very striking, and is of value as an example of a small gas undertaking making 6 million c.ft. per annum, selling gas at a price never below 6s. 8d. per 1000 c.ft., and yet perfectly able not only to maintain, but to advance, its position.

Personal service direct to the consumer by the management has been the practice, and cooking and heating by gas have been fostered successfully. It may be stated that the price of electricity in the place referred to has been from 10d. to 1s. per unit. It appears that the public must have all the household conveniences, that they are prepared to pay for them, and that they accept gas as the best means towards this convenience.

I also have before me the case of a small gas undertaking in the north, which fourteen years ago had a total output of 2½ million c.ft. per annum, and which to-day, as a result of taking in two neighbouring towns, is making 22 millions.

Gasfitting and Maintenance.

I shall now briefly detail my experiences in the control of small gas-works, with the hope that the knowledge will be of service to others, and that a fresh outlook may be given as to what policy is the best for the small gas undertaking of to-day to pursue. I am impressed with the fact that a great deal can be accomplished, and that, generally, the position of small gas-works in the country requires overhauling.

Considerable difference of opinion seems to exist in regard to the question of gasfitting being entirely under the control of the gas undertaking; and doubtless there may be isolated cases where it is not possible to have this system amicably carried out. My own experience, however, goes to show that when the gasfitting and maintenance are under the supervision of the management, the more satisfactory is the service. A proved and inexpensive method of maintenance can be carried out if the person who is appointed meter surveyor and collector has a thorough knowledge of gasfitting. When the meters are being read, any small defect or escape can be put right on the spot, and in the event of its being impossible to perform the work during the time at his disposal, then a note of the repair, alteration, or extension required is taken, and the work carried out on completion of the survey.

Showrooms: Free Appliances.

An important part is played in connection with any undertaking by the existence of a showroom. This can be carried on most economically if used in conjunction with an office where payment of accounts may be made. In my own experience in one of these towns, where hitherto there was no showroom, the sales for fittings and appliances now amount to £412 per annum. Not only can additional revenue be had, but it places an undertaking in the position of being able, by demonstration, to assist and to advise consumers as to the most efficient and economical appliances. For the collecting of accounts, an office of some kind is required, and this can usually be secured by renting a shop. The rent and taxes need not exceed £25 to £30, and this sum is but a small outlay compared with the benefits derived. Indeed, where the district to be served has a population of (say) 3000 to 4000, the sales to consumers can show a substantial financial profit.

A good deal has been done, and can still be done, by small undertakings in the way of encouraging consumers by giving free cookers and range-plates, also by the supply of meters free from hire rental. Certainly this means considerable outlay; but I find that this system is justified by the increased consumption.

Price to Prepayment Consumers: Differential Rates.

In regard to the many cases in which a higher rate is charged for gas through slot than through ordinary meters, in my opinion there is no definite reason why this should be so. While the cost may, in the first instance, be higher, I am convinced that the ultimate result is a gain to the undertaking, and it certainly means fewer arrears and bad debts. Without slot meters, in many cases, householders would not be users of gas at all. With the slot meter, the consumption is higher than with the ordinary meter. In my own Company the rates for ordinary and slot meters are the same. Another sound proposition in connection with the method of charging for gas, particularly beneficial to larger consumers, is the adoption of a differential scale; and the following has proved most satisfactory in one of these districts:

		s.	d.	
Consumption up to	12,000 c.ft. per quarter	= 7	1	per 1000 c.ft.
,, ,,	25,000 ,, ,,	= 6	8	,, ,, ,,
,, ,,	50,000 ,, ,,	= 6	3	,, ,, ,,
,, ,,	75,000 ,, ,,	= 5	10	,, ,, ,,
,, ,,	100,000 ,, ,,	= 5	0	,, ,, ,,

Make per Ton and Calorific Value.

In the far north, it may in some instances be considered that the price charged for gas is somewhat high; but it must be borne in mind that, though railway carriage of coal costs 9s. 10d. and 10s. 11d. per ton respectively from the Fife and Lanark pits, it is still possible to sell gas at anything from 6s. to 7s. 6d. per 1000 c.ft. and give service to a satisfied public. Household coal is, of course, of high price in normal times. Again, in my opinion it is a mistake to assume that small undertakings should think it necessary to supply gas of a high calorific value, as larger undertakings are supplying from 430 B.Th.U. upwards. My experience is that, provided suitable

coal is used in horizontal retorts, this quality can be supplied without difficulty, and thus over 12,000 c.ft. per ton of coal carbonized can be produced. Regarding pressure for outlying districts, I find that frequently insufficient is given for satisfactory use for cooking and power. It should be realized that in no case should the pressure, at the lowest point, fall below 3 in.

PUBLIC INSTITUTIONS: STREET LIGHTING.

It is also the duty of small undertakings to pay particular attention to public institutions, such as hospitals, halls, churches, schools, &c., regarding lighting and heating, not only in the giving of advice but by supplying free a portion of the correct size of piping and appliances, or doing a portion of the work of installation free. I have found it of immense advantage, in the way of courting favourable public opinion as to what gas can do for lighting, to maintain free of charge the lighting appliances in public institutions; only the material being charged-up.

Managers of small undertakings will do well to keep in close touch with local authority surveyors, as much can be done in placing before them the most modern methods of public lighting. Indeed, where possible it is to advantage to supply the material at cost price, in order that the most reliable appliances may be installed, in the interest of efficient public lighting. Assistance towards the cost of supplying service pipes to public lamps should be given. It is also advisable, from an economic point of view, to arrange, during the reconstruction of streets and roads, to take full advantage of such occasions to have any faulty or undersized mains and service pipes renewed. In this connection I would suggest that undertakings should, where possible, employ for the opening and filling of pipe tracks the staff of the local authority concerned, and thereby be relieved of the responsibility of resultant upkeep and resurfacing.

DISPOSAL OF TAR: GENERAL BUSINESS METHODS.

In regard to the question of co-operative sale of tar, though certainly there is a growing demand for prepared tar for road-making and other purposes, there is really no necessity for a small undertaking to face the expense of the erection of a plant, as no difficulty should be experienced in disposing of their crude tar at a remunerative figure to large neighbouring gas-works having tar distillation plant.

Many small undertakings suffer from lack of supervision and up-to-date administration. Many undertakings are run by local companies whose chief object is dividend, and who give no particular thought to what is required for maintenance and renewal of plant. I have had frequent occasion to witness cases of this kind, and to lament the entire absence of business methods, and complete inattention to consumers' needs. There are cases where the consumer has to provide the whole of the service pipe from the main; the company does nothing to supply cooking or heating appliances, and the meter supplied by the company is charged for at a substantial rental. This is not as it should be. As regards advertising the uses and conveniences of gas, it appears that the educative influence of the British Commercial Gas Association has not yet reached the directors of a number of the small gas-works.

Discussion.

Mr. H. H. GRACIE (Edinburgh) suggested that Mr. Bain's paper could be regarded as the sequel to Mr. W. E. Whyte's contribution at the spring meeting of the Association. That paper, it would be recalled, showed how the linking-up of smaller gas-works with the larger ones might be advantageously effected in different areas. Mr. Bain had gone a step further, and had unfolded circumstances favourable or otherwise to amalgamation. In Edinburgh, as an outcome of the discussion at the spring meeting, a suggestion had been followed up that the city might be able to supply gas to some of the outlying districts within a reasonable distance of the city works. With that end in view, a number of undertakings in the neighbouring districts had been approached by the Corporation; but up to the present they had not met with a ready response. He felt, however, that the industry would benefit from further amalgamations and being able to deal with future expansion. A Committee of the Association might be set up to investigate circumstances in various areas, with a view to co-ordination of policy. Mr. Bain had referred to the charge for gas to prepayment consumers. He (the speaker) thought the argument advanced in favour of supplying gas at ordinary rates through the slot meters was unsound. The author had stated that with the slot meter the consumption was higher than with the ordinary meter. As far as the Edinburgh districts were concerned, this was not the usual experience. As a rule the prepayment consumer used a smaller quantity of gas, while the cost of giving the supply was heavier, as was the expense for maintenance. It was justifiable to charge the prepayment consumer more.

Mr. J. W. MCLUSKY (Glasgow), having enumerated one or two of the safeguards that ought to be adopted if grouping was to prove successful, went on to remark that the managers of small gas undertakings had no more to fear from electrical competition than the managers of the larger concerns. The manager of a small electrical concern had the same difficulties as his competitors, similarly circumstanced, in the gas industry. Mr. McLusky suggested that it was a wise policy for a manager to explain to his corporation or to his board of directors that less should be accepted in the way of profits or dividends, and more money spent on consumers. If managers looked after the consumers, the dividends could be left to take care of themselves. Dividends accrued to an undertaking by looking zealously after the interests of the consumers.

Mr. R. M. SIMPSON (Denny and Dunipace) referred to the part of Mr. Bain's paper where the author stated the case of a gas-works' output rising through the supplying of outside areas. A point to be taken into account by a local authority when considering the supply of an outlying area was the additional local rates which would be paid into their exchequer. The increased output meant ultimately the extension of their manufacturing plant, and consequently an increase in the assessable value of their gas-works, which was within their own area. In the case of Denny, only one-third of the output was used within the Burgh itself; the remaining two-thirds being supplied to outside districts. This meant that two-thirds of the local rates levied on the gas-works was paid indirectly to the Burgh by outside districts.

Mr. DAVID VASS (Perth) did not agree that cookers should be supplied free. Like Mr. Bain, however, he was of opinion that special attention should be devoted to the illumination, &c., of public institutions such as hospitals, halls, churches, and schools. Certain public buildings, of course, were unremunerative; and these ought to be differentiated from others which gave a satisfactory return.

Mr. DAVID FULTON (Helensburgh) mentioned that the undertakings in his own area capable of being linked up were those of Dumbarton, Alexandria, and Helensburgh. The difference between his own town and some of the other towns he had mentioned was not in production, but in distribution.

Mr. BAIN, in the course of his reply, said it was to the interest of the gas industry in a small district that the churches and schools should be well lighted. It was a good advertisement for gas. The maintenance of the burners in a schoolroom should always be in the hands of the gas authorities. Experience had shown to him that it always paid the gas undertaking to send a man periodically to look after the pipes and appliances in connection with the lighting arrangements for schools, public halls, and churches.

EXPERIENCE WITH A MANUAL RETORT-CHARGING MACHINE.

Mr. HAROLD ROBINSON, of Annan, then read a paper on "Experience with a Retort Charging Machine." This appeared in the "JOURNAL" for Sept. 8, p. 542.

Discussion.

Mr. J. W. NAPIER (Alloa) remarked that Mr. Robinson had demonstrated that he had been able, without any addition to manufacturing plant, to increase the output of gas by 33 p.ct. The result was interesting and valuable. The apparatus to which Mr. Robinson had referred certainly demanded their attention.

The PRESIDENT said that Mr. Robinson had supplied the members with such a complete case that there could be little discussion. On behalf of the Association he expressed indebtedness to the author.

Mr. ROBINSON briefly replied, and explained that the capital expenditure incurred was £420, and the time occupied in charging was 45 seconds.

NEW OFFICIALS.

The scrutineers reported that the following officials had been elected for the ensuing year:

President—Mr. James Bell, of Dumbarton.

Junior Vice-President—Mr. J. W. Napier, of Alloa.

It was announced that the Junior Vice-President for the past year, Mr. H. H. Gracie, of Edinburgh, automatically became the Senior Vice-President of the Association.

Councillors—Messrs. T. W. Harper (Ayr) and Archibald Kellock (Airdrie) for three years; Mr. James Dickson (Kirkintilloch) for one year.

Auditors—Messrs. Spalding and Muir.

Mr. JAMES BELL, in accepting the Presidency, said he would do his utmost to uphold the highest traditions of the Association.

PRESENTATION TO RETIRING PRESIDENT.

Mr. NAPIER (Alloa) asked Mr. Wilson, the retiring President, to accept a memento of his year of office, which would take the form of a replica of the bronze medallions, at Lugar, of William Murdoch. Recently, he paid a visit to the birthplace of Murdoch at Lugar—a building which should be preserved. It would never do for the gas industry of Scotland to allow the birthplace of Murdoch to fall into disrepair.

Mr. WILSON thanked the Association, and the meeting terminated.

Wills.—Mr. George Brambles, who was for over forty years Chairman and Managing-Director of the Bridlington Gas Company, left estate of the gross value of £17,200, with net personalty £15,253. The gross value of the estate of Mr. Robert Moore, a Director of the Paignton Gas Company, was £6219 (net personalty, £6173). Mr. R. S. Tomson, J.P., for many years Chairman of the Luton Gas Company, left £82,400. Mr. Charles Paxton Markham, Chairman and Managing-Director of the Staveley Coal and Iron Company, Ltd., and of the Parkgate Iron and Steel Company, Ltd., and a Director of several other colliery companies, left estate of the gross value of £611,305, with net personalty £515,883. Mr. William Wormald, who was Chairman of the Yeadon and Guiseley Gas Company, left £3352, with net personalty £2867.

CITY AND GUILDS EXAMINATIONS PROGRAMME.

Arrangements for the Session 1926-27.

There is now available the official programme (published by John Murray, of Albemarle Street, London, W.), for the session 1926-27, of the Department of Technology of the City and Guilds of London Institute; and intending candidates may obtain copies (price 3s. 6d. net, or 4s. including postage) from Messrs. Lamley & Co., 1 to 5, Exhibition Road, London, S.W., or from any bookseller. Any inquiries relating to the work of the Department of Technology should, however, be addressed to the Superintendent, Department of Technology, City and Guilds of London Institute, 29, Roland Gardens, S.W.

The regulations are set out in the programme, together with the syllabuses for examinations in technical subjects. There are the names of the members of the Advisory Committees, and in addition the Department state that they are in a position to avail themselves of the advice of a number of bodies, including the Advisory Committee of the Institution of Gas Engineers. In connection with Gas-Works Practice and Gas Supply Practice, the name of Mr. Charles Hunt appears as Honorary Consultative Examiner.

The Acting Examiners for the year 1926-27 in subjects which more particularly concern readers of the "JOURNAL" are: Coke and Bye-Products Manufacture, Mr. C. P. Finn; Coal Tar Distillation and Crude Intermediate Products, Mr. F. M. Potter; Gas-Works Practice, Mr. J. Terrace; Gas Supply Practice, Mr. J. P. Leather; Gasfitting, Mr. W. L. Westbrook; Elementary Science (in connection with the three last-named examinations), Mr. W. E. Harrison; and Heating and Ventilating Engineering, Mr. A. H. Barker.

The following are the dates fixed for next year's examinations: Coke and Bye-Products Manufacture, Wednesday, May 4. Coal Tar Distillation and Crude Intermediate Products, written, Thursday, May 5, and practical, Saturday, May 7. Minor Course in Gas-Works Practice, first paper, Tuesday, May 3, and second paper on Elementary Science, Friday, May 6. Minor Course in Gas Supply Practice, first paper, Tuesday, May 3, and second paper on Elementary Science, Friday, May 6. Gasfitting, first written paper, Grades I., II., and Final, Monday, May 2; written paper on Elementary Science, Friday, May 6; Grade II., and Final, *viva voce*, Saturday, April 30; Grade II. and Final, practical, Saturday, April 30. Heating and Ventilating Engineering, Final, Wednesday, May 4. Full rules for the different examinations are published, and an appendix contains a list of text books and works of reference bearing upon particular examinations, together with the names of appropriate periodicals.

Another appendix shows that the Society of British Gas Industries offer prizes of £5 5s. and £2 2s. to the first and second candidates respectively at the examination in Gas-Works Practice, Gas Supply Practice, and Final in Gasfitting, provided that candidates are eligible under the regulation which debars teachers or persons registered as teachers from competing for prizes. Subject to a like stipulation, Messrs. Ernest Benn, Ltd., offer as prizes a copy of "Distribution of Gas," by Walter Hole, to the candidate who obtains the highest marks in Gas-Works Practice, and a copy of "The Scientific Promotion of Gas Sales," by Arthur Coe, to the candidate who obtains the highest marks in Gas Supply Practice. The Coke Oven Managers' Association offer prizes of £3 3s. and silver medal, of £2 2s. and bronze medal, and of £1 1s., to the first, second, and third candidates respectively at the Final Examinations in Coke and Bye-Products Manufacture, provided such candidates are eligible. Silver medals are offered by the City and Guilds of London Institute on the results of the Final Examination, and bronze medals on the results of the examination in the grade next below the Final, in all technological subjects.

ADVERTISING SULPHATE OF AMMONIA.

From the General Manager and Secretary of the Southampton Gas Light and Coke Company (Mr. J. R. H. Jacobs), we have received a photograph of a window display they have had on novel lines for the advertising of sulphate of ammonia. It had a magnetic effect on the public; and, during the time it was on view, the sales of small quantities of sulphate were very large. It will be admitted that the display shows great artistic merit.

SMOKE ABATEMENT EXHIBITION IN BIRMINGHAM.

FURTHER FACTS AND VIEWS.—See also the "JOURNAL" for Sept. 8, pp. 527-533.

Although the exhibition has not yet reached its end, sufficient evidence is available to show that the gas industry has gained excellent publicity from participation in it. An analysis of the Press reports, as collected by the exhibition authorities, shows that there is general recognition of the fact that gas and coke do offer the only practical solution for domestic smoke in the majority of homes.

Business Done.

The delegates to the Smoke Abatement Conference evinced particular interest in the various gas displays, and much good educational work was achieved. Among other stands, the business done at the Birmingham Gas Department domestic stand has been most satisfactory. It must be remembered, too, that the real value of an exhibition cannot be gauged from the orders actually taken during its run.

Several very useful inquiries have been received on the stand of the Birmingham Gas Department Industrial Research Laboratories; and the ease with which high temperatures are obtained by the furnaces there at work has roused much interest among Midland manufacturers.

"B.C.G.A." Stand.

Many of the delegates to the Smoke Abatement Conference were impressed by the stand of the British Commercial Gas Association; and there is no doubt that the examination of this display revealed to some of them for the first time the enormous waste which occurs when coal is burned in the open grate, and the large part which the gas industry is playing in conserving for the use of the nation the many bye-products which are obtainable from efficient carbonization of coal.

"It's the Flue that Ventilates."

Reference was made in our previous article to a notice on the combined stand of the Midland Gas Undertakings, which impressed upon architects and builders the need for "A flue in every room," and laid down the maxim that "It's the flue that ventilates." Every opportunity is being taken for bringing these facts to the notice, not only of architects, but also of all those interested in housing schemes. This should do much good, and gas undertakings throughout the country might well make this useful publicity point in any displays that they organize during the coming winter. It is a case in which the needs of the gas industry coincide with the best interests of the community, so that nothing but good can come of such efforts. The objections to the flueless room from a hygienic point of view are very real; and although it also happens that such rooms present difficulty to the salesman who wishes to heat them satisfactorily by gas, this difficulty is only incidental to the main trouble of lack of natural ventilation throughout the year.

Annual Meeting of Gas Salesmen.

On Saturday afternoon, in the conference hall at the exhibition, some 500 members of Gas Salesmen's Circles assembled for their fourth annual meeting. Of its predecessors, the first was held at the same place during the time of the National Gas Exhibition of 1923, and the other two at Wembley. These three meetings are still remembered for the enthusiasm by which the proceedings were marked; and of last Saturday's gathering it may be confidently said that it was no whit behind the earlier ones in this respect. Mr. John E. Cowen (the President of the British Commercial Gas Association) came specially from Newcastle-upon-Tyne, of whose Gas Company he is Chairman, in order to preside over the meeting; and he was ably supported by Mr. F. W. Goodenough, C.B.E. (Executive Chairman of the "B.C.G.A."). The speeches of these gentlemen were followed by brief reports of a highly encouraging nature by the Chairmen of the Circles of the work during the past year in various districts.

Miss Gladys Burlton, B.A., then gave an address which was greatly enjoyed, and which contained many sound suggestions for salesmen; the subject of her remarks being "Turning Complaints into Goodwill."

The "Glow-Worm" Open Coke Fire.

In our last issue, we described Dr. J. S. Owens' coke fire, which is shown working on the stand of Messrs. O. Bruster & Richardson, the makers of the "Glow-Worm" coke boilers. In this description it was stated that "combustion is from back to front," whereas, of course, it should have been "from front to back." Since the exhibition has been running, there has been an opportunity of seeing the behaviour of this fire in action. It is a fine piece of apparatus, which will burn gas coke as an open fire without the possibility of fumes coming out into the room and (almost as important) without dust. Care has been taken to see that ventilation is automatic and cannot be prevented by wrongful handling. Here is the "Simple Hire"

coke fire—an apparatus that will enable the industry to develop a home market for their most important and valuable bye-product. A better price for coke means a reduced price for gas.

Another point about the Owens coke fire is that in it kitchen refuse can be quickly incinerated without any trace of unpleasant odour. The compulsory destruction by householders of kitchen refuse would save the municipalities many hundreds of thousands of pounds per annum.

There have been a large number of inquiries at the stand from eminent scientific and practical men; while the general public also have manifested a keen interest in it, and a number of orders have been booked.

British Furnaces, Ltd.

On the stand of the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., are exhibited three of the gas-fired furnaces which operate on the surface combustion principle, manufactured by British Furnaces, Ltd., of Chesterfield. One furnace—the A 25—is suitable for temperatures up to 1500° C. The second furnace is known as the fusion testing furnace, and is suitable for all temperatures up to 1750° C. The third exhibit is the gas-fired coal testing furnace designed by Dr. Weyman in collaboration with Dr. Smith and Mr. T. F. E. Rhead.

Challenge Boilers.

In addition to their other specialities, the James Keith & Blackman Company, Ltd., show the gas fired "Challenge" boiler, fitted with patent temperature controller. This boiler was illustrated and described in the "Gas Salesman" on April 28 last, and the thermostat subsequently in the Aug. 25 issue. The boiler is specially suitable for situations where large volumes of hot water are required—such as in restaurants, for washing-up and similar purposes—and where space is an important consideration.

Other Exhibits.

In the model boiler house the Bromford Tube Company, Ltd., of Rocky Lane, Aston, Birmingham, have, in addition to the steam main already mentioned, specimens of their weldless steel gas mains, together with some old wooden water pipes dug up in London.

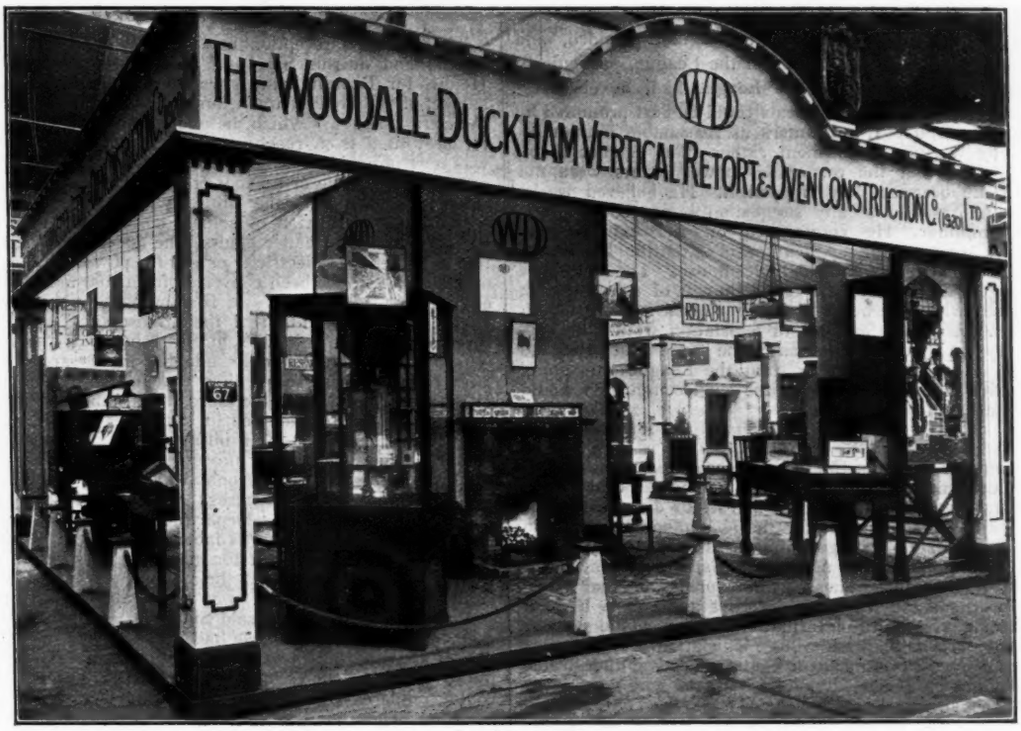
Messrs. Edward Bennis & Co., Ltd., of Little Hulton, Bolton, who display their different forms of stokers, are successfully engaged in adapting these to the use of coke fuel, as well as coal. They have also a new pattern conveyor for dealing with red-hot coke.

The Superheat Furnace Company, of Bradford, have a patent furnace for complete and smokeless combustion, which is suitable for burning coke breeze and other fuels.

A feature of the stand of the Electroflo Meters Company, Ltd., of Abbey Road Works, Park Royal, London, N.W., is the striking appearance of the reading instruments of the "Electroflo" meters. The meter is of the differential type, and is applicable to coke oven and town gas. Being electrical,

the reading instruments can be located as desired, and have, in fact, been put half-a-mile from the point of measurement. Some interesting photographs of existing installations in the district are shown. Draught instruments, &c., are also exhibited.

Industrial Combustion Engineers, Ltd., of Astor House, Aldwych, London, W.C., exhibit, among a number of their other specialities, the Bailey gas meter, which records, and may also totalize, the rate of flow of gases, and reads directly in thousands of cubic feet per minute or per hour as desired. The chart used is 12 in. in diameter, and uniformly graduated with the proper scale, so that the meter reads directly without the use of factors. This meter is suitable for compressed air or any gas at pressures varying from less than atmospheric to 300 lbs. per sq. in. A pressure compensator can be applied. Bailey meters are adaptable to the addition of pressure and temperature recorders, so that these factors may be recorded on the same chart with the rate of flow.



A PLEA FOR BRITISH GLASS.

Patriotism Made Easy.

In a general sort of way, everyone has a feeling that it is the proper thing to support home industries; but when it comes to the actual carrying into effect of the idea, this feeling is only too often not strong enough to prevail. When this is so, one or more of various reasons may be assigned for the failure, and undoubtedly in a large proportion of cases sheer thoughtlessness is responsible. Thus there is need for repetition of the exhortation to "Buy British Goods," so far as is practicable. And it is not only practicable, but easy, in the connection which forms the subject of this note—that is, lighting glassware. Messrs. Ackroyd & Best, Ltd., glass makers and metal stampers, of Morley, near Leeds, are able to demonstrate this in their extensive new stock and show rooms, at 98, Mansell Street, E.C. (opposite the Royal Mint and the Tower of London). During recent months, this firm have been especially putting up a big fight on behalf of the British glass making industry; and their efforts are such as to render co-operation by their fellow countrymen a pleasure—in fact, as stated above, it is "patriotism made easy."

By the exercise of enormous labour, toil, and expense, Messrs. Ackroyd & Best collected together at their works bands of the finest glass-workers this or any other country possesses, and are at the present time producing a wonderful variety of illuminating and ornamental glassware, vases, &c. The men who work in this industry are invaluable not only to the trade, but to the whole country. In order to stimulate the sale of British-made glassware, the firm decided to acquire and stock the large warehouse in Mansell Street with a portion of the enormous stock of glassware held at their Morley Works, in order that London should have a first-hand opportunity of seeing the fruits of an industry which up to the present has received no help from the Government. At the same time, purchasers will have an opportunity of buying out of stock in London their requirements of glassware, which has been made from beginning to end in Great Britain.

It is, of course, with the illuminating glassware that we are specially concerned here; and in this respect alone—leaving out of consideration the numberless other beautiful things on view —a visit to the showrooms will be found a real delight. There are hand-painted, as well as plain, globes and bowls of every shape and pattern, suitable for all conceivable purposes. It is inexcusable to have lighting glass that does not harmonize with its surroundings, for any imaginable colour scheme or Period style can be matched, from the simplest to the most ornate.

"Hailglass" ware (so named after the Managing-Director of Messrs. Ackroyd & Best—Mr. E. A. Hailwood) is all that it claims to be—the possessor of purity, artistic grace, charm, beauty, strength, and yet of delicious delicacy; and it is to be hoped that the firm will be completely successful in the heavy task they have set themselves. It should be mentioned that they have decided to grade their glassware. Certain patterns will be made by mass production at prices to meet foreign competition, even if it involves for the time being the selling at "no profit." Other patterns will be reserved for better-class trade, and reasonable prices asked.

Halifax Gas College Successes.—In the recent Examinations of the Institution of Gas Engineers' Education Scheme, every student submitted by the Halifax Gas College was successful. The numbers of candidates in the various grades were as follows: Gas Engineering—Higher Grade, 2 (1 First-class with distinction); Gas Engineering—Ordinary Grade, 2 (1 First-class with distinction); Gas Supply—Higher Grade, 1; Gas Supply—Ordinary Grade, 8 (5 First-class).

Bituminous Coal Conference.—The conference on bituminous coal, to be held at the Carnegie Institute of Technology, in Pittsburgh, U.S.A., has been definitely fixed for Nov. 15 to 19 next. As a result of a visit to Europe this summer by Dr. Thomas S. Baker, President of the Carnegie Institute of Technology, it is announced, several distinguished scientists and fuel technologists in Europe have accepted his invitations to attend the congress. England will be represented by Dr. C. H. Landor, Dr. R. Lessing, and Mr. Geoffrey M. Gill. The purpose of the meeting, according to President Baker, is to bring together men of all countries who have done notable work in the study of more scientific and rational utilization of soft coal. Listed for discussion are such questions as the complete gasification of coal, high-temperature and low-temperature carbonization, bye-products, and smokeless fuel.

SMOKE ABATEMENT CONFERENCE AT BIRMINGHAM.

A THREE-DAY MEETING IN BINGLEY HALL.

There was a representative attendance of public men, officials, manufacturers, and others interested in the subject of smoke abatement at the conference under the auspices of the Smoke Abatement League of Great Britain which was opened on Tuesday of last week at Bingley Hall, Birmingham. Here there is at present a first-rate exhibition, the gas portion of which was fully described in the "JOURNAL" for Sept. 8. The programme of the conference provided for discussions on both the industrial and domestic sides of the smoke problem; the industrial side being first considered.

Mr. WILL MELLAND, of Manchester (Chairman and Hon. Treasurer of the Smoke Abatement League), presided, and made an official statement of policy of the League, particularly in relation to boiler smoke. The League had, he observed, come to the conclusion that its ideals could be best promoted by regarding industrial coal consumers as reasonable human beings, and by working with them rather than against them. They recognized that the owners of power plants were not making smoke because they enjoyed it. He believed works owners would respond to any suggestion if approached in a reasonable manner. He commented on the extraordinary difference existing in the application of scientific knowledge between the engine house and the boiler house. The last ounce of knowledge was put into the establishment of an up-to-date engine house; while the boiler house was often run on rule-of-thumb lines. A certain amount of legislation would, he supposed, always be necessary, just as in the case of factories and workshops. He hoped, however, that the League was going to be so active and useful that in time legal compulsion would become almost unnecessary.

INDUSTRY AND SMOKE ABATEMENT.

Mr. A. LINDSAY FORSTER (Messrs. Chance Bros. & Co., Ltd., Glasgow) outlined a definite proposal, which was that voluntary organizations should be formed in various districts for the purpose of discussing methods for the abatement of smoke in industry. The League's suggestion was that voluntary bodies should be set up, not on a national basis, he imagined, but regional in their scope. These would consist of the industrialists concerned, and they would collect and collate a great deal of important technical information. They would also be a safeguard against mischievous legislation. What was wanted was a process of an educative character; and undesirable legislation might be avoided if industrial firms who were large fuel users were effectively organized. The bodies contemplated would further act as a check upon people offering freak remedies for saving fuel and abolishing smoke. They would afford a liaison between industrial users of fuel and expert scientific bodies, and focus attention upon the best use of our national fuel—coal.

Mr. JOHN W. GRAHAM argued that an amendment should be made in the Smoke Abatement Bill now before a Committee of the House of Commons removing the wholesale exemption of all metallurgical trades for an indefinite period, and setting-up instead an Expert Committee of the Ministry of Health empowered to exempt individual works on application for limited periods, as might be found necessary.

Councillor LUCAS (Birmingham) stated that after several months of the coal strike, the atmospheric pollution in the city was worse than before the stoppage—proving that the quality of coal used was the great factor in the smoke evil.

Dr. DVORKOVITZ observed that remedial measures could not be standardized for the whole country.

Bailie W. SMITH (Glasgow) put in a strong plea for the education of politicians, many of whom thought that smoke was necessary industrially.

Mr. C. ELLIOTT (Hon. Secretary of the Smoke Abatement League) insisted that the smoke problem should be tackled on national lines. The idea was that the voluntary organizations of industrialists should serve as a link between industrial fuel users and scientific bodies.

THE PRESIDENT.

Sir Napier Shaw was re-elected President of the League, and, in acknowledgment, alluded with satisfaction to the prospect that the work of the Committee for the Investigation of Atmospheric Pollution might be resumed in connection with the Department of Scientific and Industrial Research.

Mr. GRAHAM moved a resolution suggesting, among other things:

> That the wholesale exemption of metallurgical processes should be omitted from the Government Bill; that an Expert Committee of the Ministry of Health with powers to advise exemption for limited purposes of special works should be constituted; that steamers in home waters and Government buildings should not be exempted; that permissive powers granted to local authorities with regard to the smokeless construction of new buildings should be allowed to include private houses; and that failing these amendments, the Bill should be dropped.

The resolution was referred to the Executive Committee with a view to their taking what action they could to strengthen the Bill.

RECEPTION AND ADDRESS.

There was a reception on Tuesday evening at the Grand Hotel; and at this Sir JOHN ROBERTSON (Medical Officer of Health for Birmingham) gave an interesting address on the subject of smoke abatement, and on the great value to health of the ultra-violet rays which, he pointed out, the cloud of soot and tar prevented from reaching the earth in large quantities. It was now possible for a large boiler installation to be so worked as to produce little or no soot or tar. He agreed that with the smaller boiler plants the difficulty of operating continuously without the production of some smoke was very great. "In the case of these smaller plants," he added, "I see no alternative but the use of electricity or gas for power. Many hundreds of such plants have been converted from coal fired boilers to gas engines or electric motors in Birmingham, with very great advantage to the condition of the atmosphere." The manufacturer always complained, said Sir John, that the standard as regarded emission of smoke adopted in his area by the local authority was more severe than that in use in adjoining areas. It was very important, therefore, that some uniform standard of control should be adopted for plants of similar size, though, of course, they must aim ultimately at the abolition of all smoke. There were many processes in the metal trades which might be better and more economically performed by gas heated or electrically heated furnaces. One of the steps which the City of Birmingham Gas Department took many years ago of instituting a commercial gas laboratory, where heating experiments could be carried out for manufacturers before they went to the expense of changing their apparatus, was a step in the right direction, and had been of great value to the city.

As to domestic smoke, said Sir John, in Birmingham nearly every artisan dwelling house had a gas cooker. Gas fires, too, played an important part in the reduction of smoke; but much improvement in their construction was yet needed before they could compare with the open fire as a comfortable source of heating. They were, of course, economical and convenient in most situations. If electric radiators could be used for general heating at approximately the same cost or even a little more than that of the open coal fire, there was no doubt that this form of heating a dwelling room would oust all others, because of its elasticity in use and its comfort. For the moment, however, electric heating was a luxury for the rich, rather than for use by the average artisan. An odd electric fire in a dwelling house need not be seriously considered at the present time as a preventive of black smoke, because the real problem was how to supply the 85 p.ct. of dwellings occupied by the artisan classes with a heating apparatus which would warm the house and cook the food. For such a purpose electricity had not yet become an economical or practical proposition. It was, he added, highly important that those contemplating the erection of any dwelling house which was to be entirely heated by gas fires or electric radiators should see that they provided a shaft that would ventilate the rooms when they were closed in as efficient a manner as the open chimney did.

GAS IN HOUSING SCHEMES.

Mr. E. D. SIMON, M.Inst.C.E., and Miss MARION FITZGERALD, in a paper on "Municipal Housing Schemes and Smoke Abatement," stated that, in order to ascertain whether, in spite of having neither compulsion nor encouragement from the Government, the local authorities had taken any steps towards diminishing smoke from their new houses, the Smoke Abatement League sent out a questionnaire to all urban local authorities in Great Britain with populations of over 10,000. The total number despatched was 575; and 362 forms were filled in and returned. Some local authorities had no housing schemes; others did not reply at all. Of the local authorities who replied, 44 p.ct. were able to report that the old-fashioned kitchen range had been eliminated in all their new houses. A further 20·5 p.ct. reported that they are eliminated in some houses, but not in all; while 35·5 p.ct. have been content to retain this smoky and wasteful apparatus.

Considerable importance attaches to the replies to the question about the provision of gas cookers, because it is generally admitted that the growing popularity of gas cooking has reduced the smoke nuisance. Where these are fixed when the house is built, the tenants are encouraged to use them. If they have to make an application, and perhaps pay for fixing or hire, or both, they may, and frequently do, decide to do without. The practice of fixing gas cookers as a matter of course and free of charge is more common in the Scottish towns than elsewhere. Some local authorities stated that there was no gas supply in their area; others that it was very dear. Still others

reported experiments with electricity. Not much use has been made of gas fires in parlours and bedrooms; but gas wash boilers have a majority over coal. Independent coke fired boilers for domestic hot water supply have hardly been used at all in municipal houses.

The Liverpool Corporation have put coal ovens in 20 p.ct. only of the new houses. In the other 80 p.ct. all cooking must be done by gas, except for boiling kettles, &c., on the living room fire, which is provided with a back-boiler for hot water supply. (Gas in Liverpool costs 3s. 2d. per 1000 c.ft.). The tenants are reported to be "perfectly satisfied." Leeds has one estate (222 houses) on the same principle. It is stated that "no complaints have been received; but at the same time inquiries show that this method is more expensive to the tenants than when they can alternatively cook by means of a coal fire or on gas."

The following local authorities report that they have adopted the principal of one coal fire per house—most of them so far as their latest schemes are concerned: Manchester, Edinburgh, Blackburn, Bootle, Barry, Port Glasgow, Renfrew, and Dumfries, also Eccles experimentally in 30 houses now being built. In these cases the one coal grate has provision for cooking and hot water supply.

A good many authorities have a considerable number of what they call "all-electric" houses. Strictly speaking, they are semi-electric, because they have one coal fire (with oven and back-boiler) in the living room. Liverpool, however, has built 250 all-electric houses with no coal fire at all. Glasgow has built (or is building) 766 semi-electric houses; Gateshead, 330; Manchester, 50; Leeds, 34; Dundee, 12; Ilford, 12; Whitley, 12. Several local authorities have a few all-electric houses for demonstration purposes. Some local authorities have put in electric cookers—*e.g.*, Hackney in 114 flats, Lincoln in 50 houses (also electric wash boilers). In Woolwich, practically all post-war Council houses have electric cookers fixed; also plugs in parlour and bedrooms—the tenants finding heaters. Some local authorities, while fitting coal grates in their houses, have, when putting in electric light, wired their houses for heating also. Among the local authorities adopting this principle are Bermondsey, Preston, Rochdale, Ashton-under-Lyne, Bury, Swansea (in 500 houses), Lytham St. Annes, Peterborough, Ardwick-le-Street, Bentley-with-Arksey, Featherstone, and Gellygaer.

Experiments have also been tried with more extended use of gas. Glasgow has 2200 semi-gas flats—*i.e.*, one coal fire and all other heating by gas. Leeds has 34 houses on a similar principle, and Whitley has 12. Kensington, Ealing, and Chiswick have installed gas circulators to provide hot water when the coal grate is not in use. A large number of local authorities have carried gas points to parlours and bedrooms, although they have not fixed gas fires.

A few local authorities have made experiments with central heating. Hull has built 150, and has plans for a total of 1100 centrally heated houses. A single installation in the kitchen (slow combustion stove with oven and boiler) provides for cooking, hot water supply to bath and sink, and to radiators in the other rooms. We have been told that 90 p.ct. of the tenants in the houses already finished burn coke, not coal. The Bridlington Council built 12 houses on the same principle experimentally, but decided against more. Dundee has 518 flats heated and supplied with domestic hot water from central stations. Cooking is done by gas, and there is a coal fire in the living room. Acton has 20 centrally heated houses; 12 heated from a central boiler-house, and 8 with independent boilers. Manchester has two large estates, of 700 and 600 houses respectively, where hot water to the sinks and baths is supplied from central installations—one of which is in connection with a refuse destructor. The houses should be entirely smokeless in warm weather; but the system is stated not to be completely successful. St. Pancras has 64 flats with a central hot water system.

Good Ventilation a Necessary Element.

"Clean Air and Clean Houses" were discoursed upon by Messrs. RAYMOND UNWIN, F.R.I.B.A., and POINTON TAYLOR, F.R.I.B.A. (Chief Architect and Chief Assistant Architect respectively to the Ministry of Health), who concluded their paper as follows:

It is not easy to set out a general non-smoke producing scheme for heating, cooking, and hot water installation for a working man's house. Much depends on the particular conditions of the district, the availability and comparative capital and running costs of the various alternative services, and on the class of family which has to be catered for. Mr. Barker, in his enlightening experiments, has fully demonstrated the need for considering the last point, if scientific efficiency is to be aimed at; although until every man builds or equips his own house, it is difficult to see how all possible circumstances can be provided for without overloading capital costs. More might, however, be done to provide the means for suitable alternative equipments. A few extra gas points or electric plugs are not prohibitive as regards cost, and would meet many cases.

The provision of suitable extract flues for the products of combustion of coal fires is a matter fully dealt with under the building bye-laws of local authorities. In addition to this purpose, such flues act effectively as extract flues for ventilation purposes.

Ventilation for rooms without fireplaces is also dealt with in most codes by bye-laws. The usual requirements in this respect do not, however, provide for the modern gas fire. In the interests of health, it may well be that to require more adequate means of extracting the products of combustion from rooms in which gas burning apparatus is used than are at present compulsory, has become desirable. The use of gas in some cases has been discredited for want of such provision. Whether compulsory or not, an extract flue of adequate area, so arranged as to minimize the danger from down-draught, should be provided to every gas fire; and where this flue provides only for the products of combustion, a second extract flue for ventilation, rather than a mere air grate through the outer wall, would probably give more effective circulation of air. At least, it behoves us to recognize that the value of the smoke flue for ventilation is one of the reasons why people cling to the coal fire; and the question of securing equally good ventilation when gas or electric heating is adopted forms a necessary element in successful propaganda for smoke abatement.

We have recently been informed by eminent scientists that the effect of climate upon man's mental and physical welfare is probably more important than any other single factor. Most of us had probably appreciated the varying effects on our health and spirits of periods of sunshine or clouds; but to have it stated as being of such paramount importance will increase our ardour in the fight against the grimy despoiling agent of our wonderful natural climate, who has long outstayed his original welcome.

Discussion.

Mr. EVAN ROBERTS, Jun. (Manchester), suggested that smokeless fuel was better for open fires than gas coke. He declared that many modern grates would not burn coke.

Dr. FISHENDEN said that, notwithstanding the advance made by gas mainly, and to some extent by electricity, in regard to the equipment of the domestic house, the amount of raw coal used per head of the population for domestic purposes had not been diminished. It might be that the increasing use of gas cookers had minimized fogs; but it was probable that this was only in certain congested areas where gas cookers were more plentiful than was generally the case throughout the country.

Dr. J. S. OWENS observed that low-temperature carbonization was not necessarily the best way to approach the problem. Why not adjust the grates to burn the fuel they happened to have? Smoke abatement should make a strong appeal to working men, because they were the men who did the most deep breathing and so had the greatest inhalation of the particles into the lungs.

Dr. DES VŒUX (the Chairman of the London Smoke Abatement Society) appealed for a backing-up of the efforts of his organization and the Smoke Abatement League to get an amendment of the new Public Health (Smoke Abatement) Bill, so as to give urban authorities powers to make bye-laws requiring the provision in new buildings (including private houses) of such arrangements for heating and cooking as were calculated to prevent the formation or reduce the amount of smoke.

A resolution on these lines was passed *nem. con.*

Sir NAPIER SHAW urged that the time was not exactly favourable for formulating regulations. In future coal would have to be distilled; and the nature of the bye-products in a particular area might have to be considered in making a set of bye-laws or regulations.

The Housewife and Smoke Abatement.

On Wednesday evening, Mrs. CLOUDESLEY BRERETON discussed the question of "How the Housewife Can Help the Cause of Smoke Abatement."

Ventilation and Heating.

In a paper on this subject, Dr. LEONARD HILL, F.R.S. (Director of the Department of Applied Physiology, National Institute of Medical Research) said:

Let us not put off the demand for abolition of smoke pollution on the plea of waiting for the economic production of a smokeless fuel better than coke and gas. The modern gas fire has been perfected so as to give a maximum of radiant energy, including visible red rays which penetrate the skin and the tissues to some depth, and change-over their energy within the tissues, and are thus superior to dark heat rays, which penetrate less and warm the surface layer of the body more. The modern gas fire is a fairly efficient ventilator; the second opening into the flue now provided in the best stoves takes some extra 1000 c.ft. of air an hour out of a small shut-up room, thus raising the total ventilation to some 3000 c.ft. per hour. The radiant energy of a gas fire, however, is so great that a window can, and should, always be kept open. The gas fire requires to be controlled by use of few or several radiants, so as to prevent overheating, which is a common mistake. To arrange gas fires in coal grates is an inefficient and uneconomical plan. The gas fire as now constructed, after much scientific research, is built on lines which afford the maximum radiation at least cost, and secure removal of all fumes up the flue. The dislike of gas fires is due to bad design and escape of fumes, overheating by want of control of the fire, and lack of window

ventilation. No flueless gas fires should be used in closed rooms, especially in such rooms as are more or less sealed-up from free ventilation.

It will be a great advance if catalysts recently discovered can be generally brought into use in gas plants, and the carbon monoxide converted into methane—so doing away with the danger of gas leaks.

SMOKELESS PRODUCTION OF HEAT AND POWER.

Two papers of importance submitted on Thursday were by Dr. Margaret Fishenden (Fuel Section of the Society of Chemical Industry) on "The Outlook for Smokeless Domestic Heating;" and Mr. A. S. E. Ackermann entitled "The Engineering Aspect of the Smokeless Production of Power." Dr. E. W. Smith presided.

Dr. SMITH described Dr. Margaret Fishenden as the first lady technological fuel expert in the country. He recalled her work in Manchester some years ago, and remarked that her example was being followed in the Universities of Leeds and Manchester, which were specializing in the matter of fuel. The advocacy of smoke abatement should not be left in the hands of the ordinary householder. There was need of an organization which should be officially representative of the electrical, coal mining, coke oven, and gas industries, and fuel technologists and economists. In recent years there had been but little reduction in the total quantity of coal used for domestic purposes; but the smoke nuisance was to some extent being abated. It would appear that the coal was being used more efficiently.

McEWAN-RUNGE SYSTEM.

Considering some of the principal factors in the smokeless production of power, Mr. A. S. E. ACKERMANN, B.Sc. Eng., said that pulverizing coal adds about 2 p.ct. to its cost (which is low, because very inferior coal may be used), and causes it to yield about 5 p.ct. more steam.

Instead of firing with powdered coal in the state that it leaves the pulverizers, in the McEwan-Runge system the fine particles of coal are turned into semi-coke by being allowed to fall through one or more (often two) vertical retorts, each 30 ft. high. These are not heated externally; but there is an upward current of hot inert gases. The mean temperature in the upper retort is 600° Fahr.; this being sufficient to prevent the particles of coal from cohering. The mean temperature in the lower retort is about 1000° Fahr., which completes the process of converting the fine particles of coal into small particles of semi-coke. Smoky gas is, of course, given off during the process. About one-third of this gas is used for working the plant; the other two-thirds being available for any desired purpose. One advantage of the process is that the fine semi-coke may be stored without danger or deterioration. A second advantage is that even its unskilful use cannot cause it to produce smoke.

A wicked waste of heat, and therefore coal, is taking place at gas-works, on account of the very high temperature at which flue gases are discharged from the retort furnaces. The obvious thing to do is to place an electric light works on top, so to speak, of the retort house of every large gas-works. It is a pity that a certain natural antagonism between gas and electricity companies has so far probably prevented this from being done.

DISCUSSION.

Dr. SMITH remarked that the author had apparently held out hopes of what might be done in a combination of gas and electric works in the utilization of waste heat from the retort furnaces. It was, however, only in the larger works and those of moderate size where the quantity of waste heat was sufficient to justify the capital expenditure. If one deducted the small ones from the total number of gas-works, it could be said that well over 50 p.ct. of the waste heat in gas-works was now being used in waste-heat boilers, and steam was being raised.

Mr. E. ROBERTS, Jun. (Manchester), said that experience with pulverized fuel had been very unfortunate. Its use had resulted in some of the Lancashire works blowing-out a tremendous amount of grit. He could not understand why powdered fuel was favoured, when it had been established that coke produced steam far more cheaply, and without grit.

Bailie SMITH (Glasgow) insisted that many company-owned gas and electricity undertakings had adopted an antagonistic attitude; and this applied even to some municipal undertakings. It should be remembered that they were at a critical time in the history of coal; and there should be the fullest active co-operation, wherever this was possible.

SMOKELESS PRODUCTION OF HEAT AND POWER.

By Dr. MARGARET FISHENDEN.

[EXTRACTED.]

Of the coal which is used for industrial purposes in this country, by far the greater part is burned in boiler furnaces for the production of steam. For this object, except in certain special cases, gas or electricity has few advantages over coal, since by the application of up-to-date scientific principles efficiences as high as 80 to 90 p.ct. can be achieved from solid fuel installations. In comparison with such performances, either gas or electricity, even on an assumed efficiency in use of 100 p.ct., would not only be costly to the consumer, but its production would entail an expenditure of coal heavy in relation to the direct use of solid fuel. The average efficiency of the existing boiler plant in the country, however, is certainly below 70 p.ct.; and it is clearly of great importance, in the interests both of fuel economy and smoke abatement, that this figure should be substantially improved upon. This field also should offer an increasing outlet for coke, since practical experiment has shown that coke is very suitable—especially for low rates of steaming.

For furnace work and other general industrial heating purposes, the comparison is more involved, since the relative efficiencies of utilization of the different forms of energy are difficult to compute, or in many cases unknown. But there is little doubt that, although the actual running costs of energy bought as gas or electricity may frequently considerably exceed the corresponding bill for coal sufficient to perform equivalent services, their adoption may in many cases be advantageous. Thus, for example, although the price of a therm in electricity or gas is usually much higher than the price of a therm in coal or coke, if its use should entail a reduction in labour costs, or make possible a more accurate focussing of the heat produced upon the place where it is required, or if it should be instrumental in creating a better (*i.e.*, more valuable) product, it would be commercially sound to use it in preference to a cheaper fuel.

Many processes are available whereby coal can be converted more or less completely into gas, coke, and oils in various proportions, or into electrical energy; but their development must naturally be dependent upon the commercial possibilities which are presented. At the present time the most important of such processes are included in electricity generation and in the various systems of carbonization. But recently methods for the liquefaction of coal (the Bergius process) and for the conversion of water gas, produced from coke, into liquid fuels have come into prominence; and although these have not yet been developed commercially, their possibilities in regard to future oil production are of great interest.

It must be borne in mind that in any transformation process whereby energy is converted from one form into another, a thermal loss is inevitable, or, in other words, that, even under the most favourable conditions possible, the potential heat producing capacity of carbonization products or of electricity falls short of the original heat value of the parent coal. The deficiency may, however, in certain circumstances subsequently be counterbalanced, or more than counterbalanced, owing to the fact that the new forms of energy may, and in most cases can, be utilized with a greater efficiency than is possible when coal is burned directly in its natural state. But its immediate effect is to increase the price of gas, oil, or electricity in relation to that of coal; for the return which they give must compensate the undertaking for the thermal losses occasioned in the course of their production, in addition to meeting overhead and labour costs and reasonable interest on capital invested. If, by such processes as blending, the low-value colliery products can be converted into high-value carbonization or other products, the above expenses can often readily be met.

At the present time, about 8 million tons of coal, or only one-fifth the amount which is burned in domestic grates alone, or about 4 p.ct. of the total home consumption, is dealt with annually in our power stations with the production of about 7500 million Board of Trade units of electricity. Even the most optimistic forecast of the probable rate of expansion of supply undertakings would not lead us to expect any very appreciable amelioration of the smoke nuisance through this agency. It has been stated that in the four years 1921-2 to 1924-5 the average rate of growth has been 20 p.ct. per annum; the growth of output for power having been 25·3 p.ct., domestic supplies 27 p.ct., and traction 12 p.ct. per annum respectively.

CARBONIZATION.

Let us now pass for a moment to a consideration of other methods of coal treatment. The gas-works process fulfils the conditions both of conservation of bye-products and production of smokeless fuels—namely, gas and coke. This desideratum, however, is not accomplished without cost. Some of the coke made must be reserved for heating retorts, and there are slight leakages of gas both in manufacture and in distribution. Such causes represent an aggregate thermal loss equivalent to some 20 to 25 p.ct. of the potential heat value of the coal treated. The thermal value of saleable gas does not, as a rule, exceed about 25 p.ct., while saleable coke represents 45 to 50 p.ct., and tar 5 p.ct.

For many purposes gas coke is a satisfactory substitute for raw coal; and if we assume that convenient outlets are to be found for all the coke produced, the effective weight of coal expended in the gas making process may fairly be regarded as only about 50 to 55 p.ct. of the actual amount dealt with—that is, as the total amount less available gas coke. Since, on this basis of calculation, gas with a potential heat value of 25 therms may be considered as the return from a net expenditure of 50 to 55 therms in solid fuel, the thermal efficiency of the conversion of coal into gas becomes 45 to 50 p.ct., or, taking account of tar, 50 to 55 p.ct. These are the figures upon which must be based calculations of the inroads into our national fuel

supplies consequent upon the substitution of town gas for solid fuel.

Complete Gasification.

By the injection of steam and air into the retorts during carbonization, it is possible to gasify an increased proportion of the coal, with an accompanying reduction in the coke yield. The process may, indeed, be pushed to its limit, when the coal is completely gasified; no bye-products other than a small quantity of tar being yielded. The over-all thermal efficiency of the complete gasification process, however, is less than that of normal gas-works procedure; gas alone accounting for some 60 p.ct., and tar for about 5 p.ct., of the heat of the coal treated. Further, as more and more steaming is resorted to, not only does the volume of the gas produced increase out of all proportion to its thermal content (or, in other words, its calorific value per cubic foot rapidly decrease), but its specific gravity also rises. Since, however, energy in the gaseous form commands a high price per therm, and can be more efficiently applied than can solid fuel, it does not necessarily follow that the process of complete gasification is to be ruled-out on the grounds of low thermal efficiency, especially as it is applicable to non-coking coals such as would not serve for ordinary gas-works purposes.

The real test is the price per therm at which the gas can be produced; and a lessened efficiency may be justified by the use of cheaper plant, elimination of labour, &c. But this method of carbonization is not generally suitable for town gas supply—particularly as the low calorific values and high specific gravity of the gas would necessitate the use of much larger mains or higher pressures than are at present required, and would entail a relatively heavy cost of distribution per therm. Although the application of moderate steaming is now looked upon with more favour, and is being increasingly adopted in the gas industry, the experiments of the Research Sub-Committee of the Institution of Gas Engineers led them to the conclusion that complete gasification cannot be regarded as a commercial proposition with existing plant. For industrial requirements, gas of a much lower heat content per cubic foot than is usually supplied by gas undertakings can often be utilized satisfactorily; and it may in certain cases pay to instal plant for the manufacture of low-grade gas on the premises, especially if it can conveniently be situated close to the point of application of the gas, and the length of pipe requisite for its transmission be therefore reduced to a minimum.

Thermal Value.

Until lately, schemes involving the output of large volumes of gas of relatively low heating power were of little interest to the domestic consumer; but certain advances have considerably modified the position. Chief among these is the development in regard to charging for gas by its heat content, instead of by its volume. Recent years have seen an enormous expansion of the use of gas for the production of power and heat; and in addition to this, preliminary investigations have indicated that, with certain qualifications and reservations, the performance of gas heated appliances, if these are suitably adjusted, is dependent rather upon the aggregate number of heat units in the gas consumed than upon the actual calorific value per cubic foot, or, as it were, the concentration of heat in the gas. As the slogan of the commercial gas world expresses it: "One B.Th.U. is as good as another." It has been pointed out by several investigators that this is not entirely true; but, generally speaking, a wide range of calorific value is without any appreciable detriment to the efficiency or convenience of gas in use, so long as the burners are adjusted to the particular value which is to be supplied.

In view of the high price which gas commands per therm in comparison with other fuels, it is not surprising that gas-works practice should, in general, have sought to increase the yield of the primary product—the gas itself—to the maximum extent compatible with the upkeep of a satisfactory standard of quality. As has already been stated, during recent years methods have tended in the direction of the more complete gasification of coal, of increasing the gaseous yield at the expense of the coke yield by introducing steam to the coal during the heating of the retorts, or of the separate production of water gas for admixture with higher grade straight coal gas yielded by normal carbonization installations. No single method of production can be said to be generally most advantageous. Mr. Ferguson Bell, in his Presidential Address to the Institution of Gas Engineers in 1925, stated that "complete gasification has not, so far, fulfilled expectations. The low calorific value of the gas produced renders it unsuitable for general distribution over large areas; and also the financial results compare unfavourably with other methods of carbonizing where bye-products return anything from 50 to 80 p.ct. of the cost of coal used. It is suitable as an auxiliary to the coal gas plant." Mr. Samuel Tagg, occupying a similar position in the previous year, said that "as little or no immediate relief may be expected in the cost of standing charges, raw materials, or labour, the prospect of further reductions in the price for gas (which is generally low in comparison either with pre-war prices, or the cost of alternative sources of heat energy) appears to lie in an extension of business, in increased values for the secondary product coke, and in higher production efficiencies and economies."

Comparative Figures.

The consumer of gas is mainly interested in obtaining the maximum number of heat units at the lowest possible cost, however produced; and this there is little doubt the gas industry is making every endeavour to supply. The price of gas on a thermal basis, however, is somewhat high in relation to that of coal; for the value of gas coke as a fuel is not at present such as to enable it generally to command a higher price than coal, and the gaseous product must, and can, bear the major proportion of such remaining costs of manufacture, &c., as are not covered by the sales of other bye-products. The current price of coal gas is about 8d. to 12d. per therm; while gas coke usually fetches some 35s. to 45s. per ton (1·5d. to 1·7d. therm), as compared with high-grade coal at 45s. to 55s. per ton (1·7d. to 2·1d. per therm). The industry is a very important one; and both the capital invested, which now exceeds £170,000,000, and the total quantities of gas made are steadily increasing. The amount of coal carbonized yearly by statutory and non-statutory undertakings aggregates some 16 to 18 million tons; the gas produced exceeding 1000 million therms.

The coke oven industry has grown up specifically for the manufacture of coke for metallurgical purposes, and particularly for use in blast furnaces. The solid fuel is thus in this case the primary product; and the chief aim is to produce coke which conforms to the necessary special requirements. The yield of coke is about 12 or 13 cwt. per ton of coal carbonized, or thermally the equivalent of some 60 p.ct.; while tar again accounts for about 5 p.ct., and disposable gas at the best, in up-to-date regenerative systems, for about 10 p.ct. The over-all thermal efficiency is thus closely comparable with that attained in other systems of carbonization.

With coal at 80s. a ton, coke at 40s. a ton, gas at 10d. a therm, and electricity at 2d. a unit, the costs of any given number of potential heat units are in the ratio of 1 : 0·8 : 5·3 : 31; while the amounts of coal involved in their production are in the corresponding ratio of 1 : 1 : 1·9 : 7·7. Since, however, it is never possible in practice to utilize the whole of the energy theoretically possible of generation from any source, but only a proportion which is far less for coal than for either gas or electricity—or, in other words, since the "efficiency" of heating appliances adapted to the burning of coal is much inferior to that of gas or electric alternatives—the above figures must be considerably modified in order to arrive at a true comparison of the relative costs of equivalent heat production.

Gas and Electric Cooking and Heating.

There are, moreover, many different aspects from which alternative methods of heat production may be considered; and since we are concerned not always mainly with the quantity of heat available, but more often rather with the production of comfortable conditions, it does not necessarily follow that computations based upon equal heat production will be indicative of actual needs. It is obvious, for instance, that neither gas nor electricity shows to the best advantage for continuous heating; for intermittent use the fact that either can be turned on or off at will results in a substantial reduction in the amount of heat required as compared with that necessary from a continuously burning coal or coke fire. Gas fires for periodic use aggregating only a few hours a day, generally prove in practice decidedly cheaper than either coal or coke fires. Where energy can be obtained for less than 1d. per unit, electricity may be regarded as a serious rival of coal for intermittent heating. For continuous heating, the cost of gas is very high, that of electricity quite prohibitive, in relation to the cost of solid fuel.

Gas cookers are convenient and easily controlled; and unexpected demands for hot food can be met with ease. The efficiency of the gas oven is greatly in excess of that of coal heated ovens; and so appreciable is this advantage that, were the oven the sole consideration, gas would prove not only more desirable to use than coal, but actually cheaper as well. But due regard must be paid to the fact that, while the gas consumed is being applied solely to cooking operations, the coal range is available for boiling pans, heating irons, producing a supply of hot water for domestic use, &c. When, however, such secondary services are not required, a gas cooker will probably prove more economical in use. The maintenance and running cost of electric cookers as a rule is higher than that of gas cookers; but in certain cases their installation might be justified. For water heating electricity is much dearer than gas; and either is much dearer than the independent coke fired boiler.

It may be gathered that, for the production of heat, electricity, except in certain special cases, may be regarded as a luxury, though its adoption for cooking purposes is likely to increase more rapidly. There has been for many years a rapid and continuous increase in the number of gas heated appliances—and especially gas cookers of various kinds—loaned or hired or sold by the various undertakings; but the total quantity of coal dealt with by the gas industry (16 to 18 million tons annually) is still far exceeded by that which is burned in its raw state in domestic grates alone (40 million tons annually), and this notwithstanding the fact that very considerable quantities of gas are required for industrial purposes. There is little doubt, however, that in many households the replacement of the old-fashioned kitchener by a gas cooker and a small coke

fired boiler or open grate with back-boiler for hot water supply, will prove not only a convenience, but actually an economy. For such purposes, and for warming rooms which are occupied for only a few hours each day, coal gas will undoubtedly be increasingly adopted; but its relatively high cost for water heating or for warming continuously occupied rooms will prevent its exclusive adoption for all purposes, and the demand for a cheap solid fuel is likely to persist. The problem which confronts us is therefore the production of a satisfactory smokeless substitute for raw coal which, used in conjunction with gas and electricity, will make feasible the elimination of the domestic smoke nuisance.

GAS COKE FOR HOUSEHOLD USE.

In view of these considerations, it is not surprising to find that of late much attention has been directed towards the possibilities of gas coke for household use. The total annual consumption of gas coke in this country approaches 7 million tons, but most of this is used for industrial purposes. With the housewife, gas coke is unpopular—largely, no doubt, on account of the difficulty of ignition and relatively low combustibility. These drawbacks are to be attributed partly to the low volatile content of gas coke, and partly to its inherent physical characteristics; but they are frequently accentuated by the presence of large amounts of moisture and ash, and by the practice of selling coke ungraded—*i.e.*, not separated according to size. The result is that, while ordinary gas coke can be used without difficulty for central heating installations or for independent boilers, in open grates, coke fires, although they usually have a thermal advantage as compared with coal, are difficult to light, and difficult to maintain unless very big fires are kept up; while in the kitchen ranges they may fail to heat either oven or water boiler satisfactorily.

There is little doubt that, of the large amount of coal used in this country for domestic purposes, by far the greater proportion finds its way into the kitchen. But here coke unfortunately frequently fails to put in a creditable performance. The failure is not due solely to the nature of coke as a fuel, but also to the design and construction of many of our kitchen ranges, which allow of in-leakage of cold air to oven and boiler flues. The consequent chilling of the hot products of combustion may prevent coke from acting successfully, although when coal is used the passage of flame around the flues may save the situation. Such a failure of coke, however, is an indication of the unnecessary extravagance with which coal is burned in such ranges. With improved draught control and flue entrances placed low in relation to the fire bed, so that even when the mass of fuel in the grate has fallen low air cannot be drawn into them without previously passing through a layer of incandescent fuel, there is no reason why high-grade coke should not be able to replace raw coal for all domestic purposes. On the other hand, furnace practice has shown the important function of radiation in the heat transfer from hot gases to solid surfaces; and since the radiation from luminous flames is greatly in excess of that from non-luminous hot gases, it will probably be necessary to reckon with the fact that heat transfer may be less rapid with coke than with coal as fuel. It might therefore be advisable so to modify the design of kitchen ranges as to take advantage of the high intensity of direct radiation from incandescent coke for oven heating purposes.

However this may be, the housewife generally cannot be expected to consider coke an attractive substitute for coal unless cleaner and more readily ignitible qualities can be offered to her. The shortcomings of ordinary coke as a domestic fuel, and the improbability of gas or electricity in the immediate future wholly displacing solid fuels, together with a growing realization of the seriousness of the smoke problem, have thus led to a re-adjustment of ideas on the subject of coal carbonization. And simultaneously with the development of processes aiming at the complete gasification of coal, or at least at a substantial increase in the gas yield, investigations have been proceeding with a view to perfecting a method designed primarily for the production of a free-burning, smokeless coke, suitable for domestic and other purposes, and for the recovery as by-products of fuel oil, gas, oil, and motor spirit as a possible home source of supplies for both the navy and the mercantile marine. This process is based upon the carbonization of coal at temperatures low in relation to those obtaining in normal gas-works practice, and is therefore termed "low-temperature carbonization," other processes, in contradistinction, being referred to as "high-temperature carbonization." Its possibilities from the point of view of the manufacture of an easily combustible solid fuel have long been foreseen; but practical difficulties have barred the way to making the process a successful commercial venture.

Pending the proving of the low-temperature process, it would seem that the existing high-temperature carbonization industries are to be looked to as the most hopeful source of more immediate supplies of solid smokeless fuels. Dr. E. W. Smith has stated that, while gas undertakings vary in the care they have taken in coke production, those companies which pay due regard to supplying their customers with a dry, graded coke usually have little trouble in disposing of their products; and that, although gas-works coke may not be an ideal smokeless fuel, yet its uses are rapidly extending. Dr. Smith's experience leads him to the view that if solid smokeless fuel is to meet with success in the domestic market it must (1) be sold on a competitive basis with house coal, (2) be combustible and easily ignitible, and (3) not cause the user extra trouble with ash or smell.

COAL BLENDING.

It is now well known that the combustibility of a coke is not determined solely by its volatile content or chemical nature, but is also closely associated with its physical structure; and it has been shown that by the proper blending of different types of coal prior to carbonization, cokes of relatively high combustibility can be produced, even by high-temperature processes. Much work still remains to be done before successful results can safely be anticipated in all cases; and the whole subject is yet in a state of some uncertainty. Modifications of methods in full-scale installations are bound to be gradual; but the simultaneous production of a high gas yield and coke of improved quality should offer an attractive prospect to the industry.

Further, since a steady market for coke should react favourably upon the price of gas, increase in the demand for one might be expected to induce an accompanying increase in the demand for the other, and thus to accelerate the displacement of raw coal.

DISCUSSION.

Mr. ROBERTS urged that efforts should be directed towards reducing as much as possible the size of flues. He suggested that the reduction in smoke from domestic fires lay in improved flue construction.

Dr. OWENS thought that the function of domestic heating appliances extended beyond the mere consideration of heating efficiency; and he pleaded for a wider outlook upon this point.

Councillor MUNRO (Glasgow) stated that in his city they were selling smokeless fuel at less than the price of ordinary coal.

Dr. J. T. DUNN (Newcastle) considered low-temperature coke was better than any other coke for domestic use. He believed that when it became available it would be generally adopted.

VISIT TO THE WINDSOR STREET GAS-WORKS.

A party of delegates were on Thursday taken over the Windsor Street Works of the Birmingham Gas Department. Mr. J. Foster (Engineer-in-Chief) and Mr. T. F. E. Rhead (Chief Chemist) received them at the entrance. The visitors then proceeded direct to the reception siding, where coal comes into the works, and along the viaduct to the top of the storage hopper of the Woodall-Duckham retort house. They were taken to the charging stage, and also saw the coke being discharged after carbonization. The method of conveyance of the coke to the sizing screens was examined; and the party were then conducted through the purifier house, and shown the exhausters, washers, and station meters. Examination was made of the water gas manufacturing plant; and the booster and governor houses were also inspected. The visit concluded with a tour through the stove repair shops and the meter shops of the Gas Department. On leaving, each member of the party was presented with a brochure, containing illustrations of the various gas-works of the Corporation, and particulars as to their output and construction.

Extraction of Coals by Benzene.

In the course of an article in the issue of "Chemistry and Industry" (the Journal of the Society of Chemical Industry) for Sept. 3, Prof. William A. Bone, D.Sc., F.R.S., dealing with "The Coking Propensities of Coals," refers to the discussion at the Society of Chemical Industry last year upon his paper on the same subject. Prof. Bone says: In the course of the discussion, Dr. H. G. Colman asked whether the extraction of coals by benzene at the pressure employed by us might not effect "a partial resolution of the complex molecules . . . at temperatures of 200° C. and over . . . (in which case) the benzene extract would not consist entirely of substances originally present in the coal, but would contain, perhaps in large proportion, less complex substances formed by the early action of heat on some of the original coal constituents." In reply, I said that, while we could not be quite sure that "in extracting coals with benzene under pressure, no partial resolution of the more complex molecular aggregates in the coal-substance occurs, yet it may be concluded with some confidence that no material decomposition (in the sense of breaking-down) of molecular structure occurs;" and I promised to make some further experiments to test the matter. These experiments have now been made, with the result that it has been shown that the effect of maintaining a bituminous coal at a temperature of 225° to 250° C. in nitrogen, for a whole week prior to its being extracted by benzene under pressure, is to decrease very materially the amount of the crude extract obtained. This now enables us to give a definite negative answer to Dr. Colman's question.

SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).

Visit to the Ardrossan Gas-Works.

About sixty members visited the gas-works of the Ardrossan Town Council on Saturday, Sept. 4. The visit, which was on the invitation of the Town Council, should have taken place during May, but owing to the industrial crisis was postponed. The party were welcomed by the Convener of the Gas Committee (Councillor MacDowall), who said he was confident that they would find the works comparable with any of a similar size in Scotland.

In small groups the visitors were shown over the works by Mr. R. Sturrock (the Manager) and his assistants. A 75,000 c.ft. per day "Simplex" water gas plant was erected in 1925, and commenced operations in September of that year. The generator is built of firebrick, and has a capacity of 2 tons. It is fitted with a "Sydenham" grate, which has entirely eliminated clinkering troubles. The plant works on the cycle of six minutes' blow and twenty minutes' run. The generator is pricked up and cleaned every four hours; fresh coke being added through a manhole at the top of the generator. The air is admitted during the blow period at the base of the generator through a 4-in. main, and is forced in by means of a Sturtevant No. 1 fan, driven with a 2½ B.H.P. steam turbine, which has a speed of 4400 R.P.M. The horizontal retort benches were erected by Mr. R. S. Workman, of Saltcoats; and in conjunction with the "Simplex" plant, a make of over 17,000 c.ft. of gas per ton of coal carbonized is maintained. The quality of the gas produced is tested by a Boys water flow calorimeter, and is on an average 450 B.Th.U., showing a production of 76·5 therms per ton of coal carbonized.

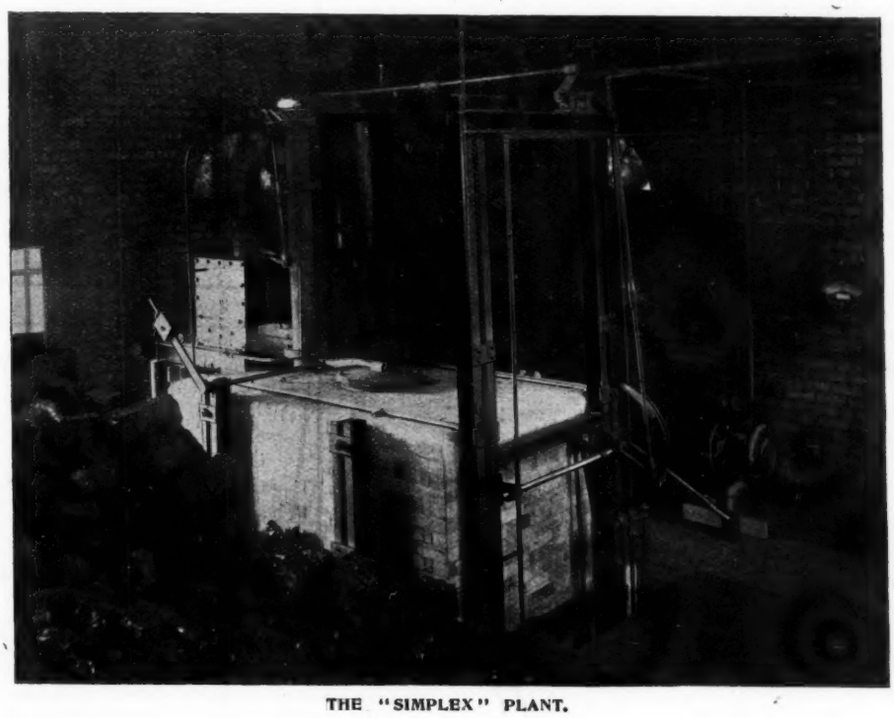
The main feature of the plant is the small initial cost, which makes it profitable to instal in any size of works. Again, no skilled labour or extra men are required; the retort stokers (having fewer retorts to charge when the plant is working) attending to it. Another feature is the small ground space occupied. For the year's working, the coke available for sale per ton of coal carbonized with the plant full-out was 6 cwt. The coke used per 1000 c.ft. of gas produced is on an average 45 lbs. The gas produced per ton of coke is 50,000 c.ft.

At the close of the visit, the party sat down to tea, under the chairmanship of Councillor MacDowall.

The CHAIRMAN, proposing the toast of the Association, said his Council were glad to welcome them. The desire of the town was to have works which were efficient and run on economical lines; and they claimed that the Ardrossan Gas-Works came under this category. In 1903, when the present works were laid out, their annual output was about 24 million c.ft.; whil to-day it was approaching 42 millions. Additions had been made to the works from time to time; the latest being the "Simplex" water gas plant, which had proved most satisfactory from the start.

Mr. ROBERT GRAY (President), returning thanks, said the Association were glad to see Mr. Sturrock in his own works, as he was one of themselves. They had found the works in a fine condition; and the afternoon had been well and profitably spent.

Replying to the toast of "The Gas Industry," proposed by Bailie FULLERTON, Mr. JOHN WILSON, of Motherwell (President of the North British Association of Gas Managers), said theirs was a great industry; and if they were to carry on the traditions handed down to them, they must fit themselves thoroughly for the task by technical training. Properly trained technical men were needed; and he might say they had one of these men in Ardrossan. He knew the Junior Association were not too well satisfied with the technical education scheme devised by the North British Association; but he hoped they would bear with the parent body, and would give the scheme their utmost support. Time would clear away a lot of the difficulties. They must have students to make the scheme what it ought to be; and he could assure them that the North British Association were looking after the interests of the juniors, and trying to hasten the day when the education scheme in Scotland would be completely satisfactory. Referring to the inspection of the "Simplex" installation that day, he said it was a very neat and complete little water gas plant, and a plant that was well devised to supply the needs of small gas-works.



THE "SIMPLEX" PLANT.

Hydrogenation of Coal in Presence of Catalysts.

The importance of the presence of inorganic constituents, and the effect of catalysts, on the carbonization of coal, have been shown by Lessing and by Cobb and Marson. Bergius, though not regarding the presence of catalysts as necessary during the hydrogenation of coal, yet adds 5 p.ct. (calculated on the raw coal) of iron oxide to the autoclave charge. Absorption of sulphur is one function he attributes to the iron oxide. In "Fuel in Science and Practice" for August, Bowen and Nash describe experiments on the hydrogenation of strongly coking Arley coal at 480° C. and in the presence of varying amounts of nickel and iron oxides. Fierz David carried out somewhat similar experiments, but did not employ steaming, as Bowen and Nash did, and to which the latter investigators attach considerable importance. As a result of their work, the authors say that nickel and iron oxides have a marked catalytic effect. Under comparable conditions, up to 45-64 p.ct. of oil products was obtained with nickel oxide catalyst, and up to 30-95 p.ct. with iron oxide. All the experiments were conducted in the absence of liquid media. The proportion of phenols and bases in the oils obtained with these two oxides was approximately the same, irrespective of the oil yield, and mean values were 9·21 p.ct. of phenols and 6·41 p.ct. of bases. The light fractions obtained were not fully saturated, and their amount depended on the maximum temperature employed.

REGISTER OF PATENTS.

Distribution Pressure Control.—No. 256,001.

PILLINGER, G. C., and SUNDERLAND, L., both of Albemarle Street, S.W. 1.

No. 14,321; June 2, 1925. No. 2379; Jan. 27, 1926.

This invention relates in particular, but not exclusively, to the supply and distribution of gas, water, or other fluids. It has for object the provision of pressure augmenting means to be placed at any point in the supply system and to be controlled automatically by the pressure of the supply at any point, being put into or out of operation as the supply pressure falls below, or rises above, a predetermined value.

The means comprise a fluid supply system having a reservoir in series therewith, a pressure augmenter (such as a centrifugal or other pump, connected in the fluid supply system on the inlet side of the reservoir and such that, when normal conditions obtain in the supply system, fluid can flow directly through the pressure augmenter and maintain the pressure in the reservoir), driving means for the pressure augmenter, and electrically actuated means to put the augmenter into action when the demand for fluid exceeds the supply, and to shut down when normal conditions obtain.

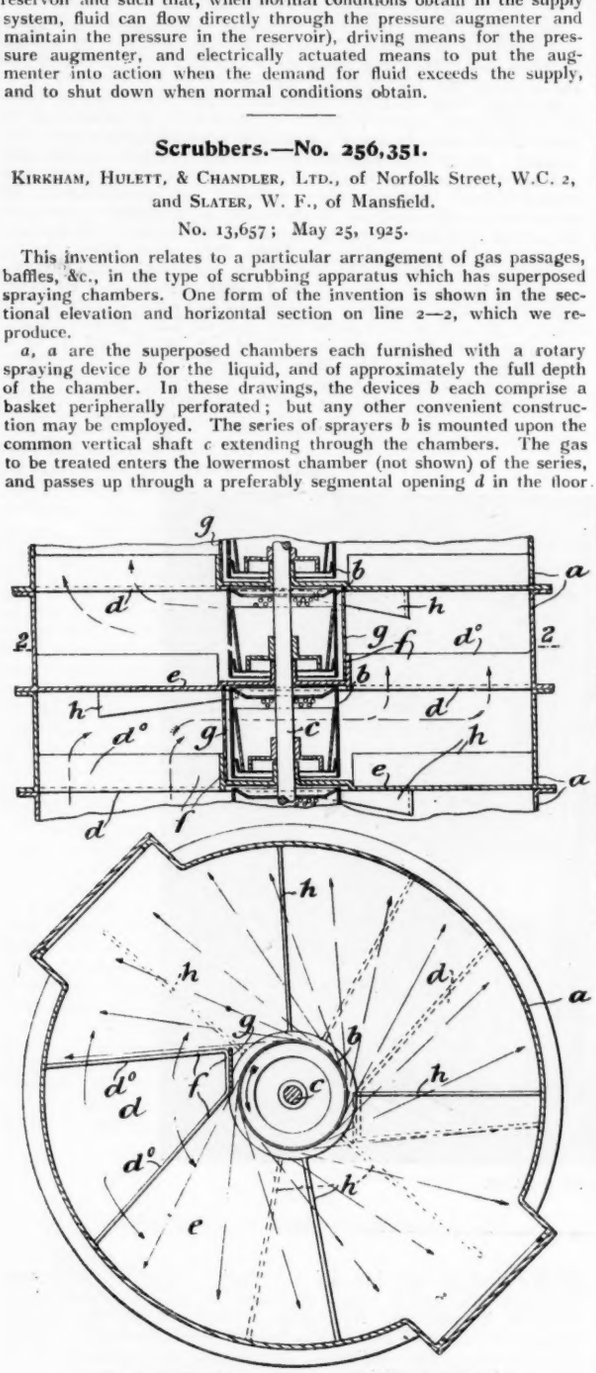
Scrubbers.—No. 256,351.

KIRKHAM, HULETT, & CHANDLER, LTD., of Norfolk Street, W.C. 2, and SLATER, W. F., of Mansfield.

No. 13,657; May 25, 1925.

This invention relates to a particular arrangement of gas passages, baffles, &c., in the type of scrubbing apparatus which has superposed spraying chambers. One form of the invention is shown in the sectional elevation and horizontal section on line 2—2, which we reproduce.

a, *a* are the superposed chambers each furnished with a rotary spraying device *b* for the liquid, and of approximately the full depth of the chamber. In these drawings, the devices *b* each comprise a basket peripherally perforated; but any other convenient construction may be employed. The series of sprayers *b* is mounted upon the common vertical shaft *c* extending through the chambers. The gas to be treated enters the lowermost chamber (not shown) of the series, and passes up through a preferably segmental opening *d* in the floor



Ammonia Scrubber.—Kirkham, Hulett, & Chandler.

e of the superposed chamber into the latter; this segmental form having the opposed sides d^0 approximately parallel to the path of the sprayed liquid (indicated by the dotted arrows) which is thrown off tangentially from the sprayers *b*. *f*, *f* are flanges or lips with which the segmental opening *d* is furnished so as to allow of the accumulation of a layer of liquid in the bottom of the chamber; and *g* is a baffle to cut off the sprayed liquid from the opening. The gas which passes up through this opening *d* is then deflected to either side as indicated by the solid arrows, and passes around the chamber in opposite directions, coming into intimate contact with the sprayed liquid and eventually passing out through a second segmental opening *d*, approximately opposite to the first segmental opening, into the next superposed chamber *a*.

It will thus be seen that the liquid, which passes down through the successive chambers in the ordinary way and is discharged from the sprayers in each chamber, is brought into very intimate contact with the gas. To increase further the path of the gas, a series of verticle baffles *h*, *h* may be provided with each chamber, projecting from the bottom of the chamber and depending from the top thereof, respectively, so that the gas pursues a staggered path as it flows around the chamber in either direction from the inlet *d*.

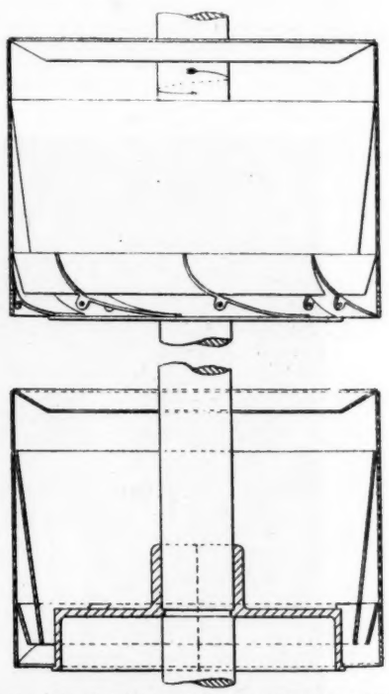
Various modifications of the arrangement are also described in connection with detail drawings.

Sprayers for Gas Scrubbers.—No. 256,358.

KIRKHAM, HULETT, & CHANDLER, LTD., of Norfolk Street, W.C. 2, and SLATER, W. F., of Mansfield.

No. 14,416; June 2, 1925.

In the sprayer which is the subject of this invention, the bounding rim is a vertical perforated cylinder, and for raising the liquor means are disposed in the annular space between the perforated rim and the boss by which the sprayer is mounted on the revolving vertical shaft. These means comprise curved impeller blades, and lift the liquor, which under centrifugal action is forced through the perforations. By altering the angle of the impeller or pumping vanes, the liquor can be lifted over the top of the perforated rim; and to safeguard against this, the upper edge of the rim is bevelled over and guarded.



Sprayer for a Scrubber.—Kirkham, Hulett, & Chandler.

In the type of apparatus in connection with which the improved sprayer is proposed to be used, and in which the gas to be washed takes a circular course round the sprayer, instead of passing upwards through the spray, it is essential that an absolutely even distribution of spray should be obtained; and for this purpose inverted truncated cones are fitted above the propellers and inside the vertical perforated rim in order to compel the liquor to pass through certain predetermined areas on the rim.

Fully detailed drawings accompany the specification; and of these we reproduce a sectional elevation and a central vertical section, which make clear the features of the invention.

Drying and Neutralizing Sulphate.—No. 256,385

SMITH, T. B., of Middlesbrough.

No. 17,895; July 13, 1925.

This invention has for its object to provide an improved apparatus for carrying out the well-known process of neutralizing and drying sulphate of ammonia.

One convenient form of apparatus in accordance with the invention may consist of a shallow steam-heated pan of circular form, preferably mounted on a concrete base and suitably packed with insulating

material. At the centre of the pan is positioned a vertical shaft connected by gearing to a horizontal power-driving shaft. At the lower end of the vertical shaft is fixed a collar to which are secured radially two distributing and mixing arms consisting of rods on which are mounted a plurality of blades arranged at a suitable angle and maintained in position on the rod in any suitable manner; the blades of one arm being arranged to convey material from the periphery of the pan to the centre, while the blades of the other are adapted to transfer material from the centre to the periphery.

Each rod is provided with a roller or wheel at its outer extremity adapted to run in a circular guideway. A weighted lever is attached to the rod near the outer end of the arm; and by means of this the rod, together with the blades, may be rotated into an inoperative position. Suitable stops are provided for determining the amount of displacement of the stirring arm blades; and the operating levers may be operated by hand or by any suitable trip device.

In operating the machine, the requisite amount of salt and reagent is fed into the pan, and then the stirring arm or set of arms which is adapted to convey the material towards the centre is first of all thrown into operation until the charge is evenly carried to the centre. At this stage the second set of arms, adapted to transfer the salt to the periphery, is thrown into operation. When both arms are in operation there will be a continuous agitation of the material, which is continued until total drying of the material is effected, whereupon, by throwing out of operation the stirring arm conveying towards the centre and opening a suitable outlet near the periphery of the pan, the material is discharged.

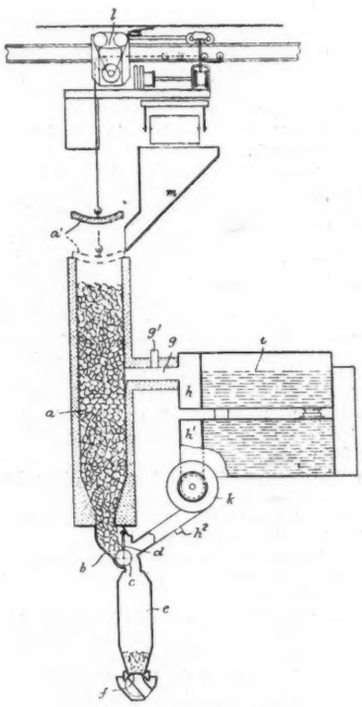
Cooling Coke.—No. 256,727.

WOODALL-DUCKHAM (1920), LTD., and REBER, J. W., both of Grosvenor Gardens, S.W. 1.

No. 13,618; May 25, 1925.

In cooling coke by circulating gases through it and through some form of apparatus for heat recovery, such as a waste-heat boiler, for the maximum usefulness of the recovery apparatus the heat applied to it should be as constant in temperature as possible; and the patentees claim that by the present invention this object is attained by keeping a considerable reserve of hot coke above the body of coke through which the gases are circulating, and causing this hot coke to travel into the gas-stream at a rate as constant as possible.

One form of the apparatus employed is shown in vertical section herewith. The cooling chamber *a* is in the form of a shaft constricted at its lower end and with an inclined bottom *b*. At the lower edge is a coke discharging device *c*, with hangers *d* (of known construction), which determine the regular discharge of the coke from the cooling chamber into the receiver *e*. The latter is connected air-tight with the cooling chamber, and is provided with a water-sealed door *f* of known kind which is opened periodically to discharge the coke.



A "W.D." Dry Coke Cooler.

An outlet pipe *g* at about the middle of the height of the chamber *a* connects the latter with the products inlet chamber *h* of the waste-heat boiler *i*, of which the products outlet chamber h^1 is connected with the intake of a fan *k* whose discharge is connected with the receiver *e*. The fan, therefore, circulates the cooling gases through the lower half of chamber *a* and the waste-heat boiler *i*.

The chamber *a* is kept substantially full of coke; and its upper part is normally closed by a plate a^1 shown in dotted lines. When, as determined by the rate at which the discharging device *c* is operated, the chamber is ready to receive another charge of coke, the plate a^1 is raised to the position shown in full lines by the approaching telpher carriage *l* which is bringing a skip full of hot coke into position for discharge into the hopper *m* and thence into chamber *a*. The telpher carriage then recedes and the plate a^1 descends to close the chamber. In no case is the level of the hot coke in chamber *a* allowed to fall to the level of the outlet pipe *g*.

As is known, it is advisable to substitute continuously or intermittently, for a portion of the circulating gases, a like portion of air to ensure combustion of any combustible gas which may be generated in the cooling chamber. In the construction shown in fig. 1, this air is drawn through a valve g^1 into pipe *g*, so that the combustible gases are burnt in the waste-heat boiler, and the corresponding volume of gases is expelled through valve h^2 on the discharge side of the fan *k*.

The fact that the chamber contains a considerable reserve of hot coke make it worth while to provide it with a water jacket, and to use this jacket for preheating the water fed to the waste-heat boiler, or to connect the water space of the jacket with that of the waste-heat boiler. Such arrangements are also described, illustrated, and claimed.

Taps.—No. 256,465.

YATES, H. J., and HOWLETT & CO., LTD., both of Birmingham, and DOLPHIN, J., of Hampton-in-Arden.

No. 94; Jan. 2, 1926.

This invention, relating to taps or cocks, is particularly applicable to such small ones as are used in connection with gas stoves; the object being to construct the tap so that it will operate as a safety appliance.

The chief claim is for "a tap or cock comprising a casing containing a valve with which is associated a spindle projecting from the casing, an operating lever or bracket mounted upon the spindle, and a pivoted handle on the lever or bracket, said handle being arranged so that it hangs down when the valve is closed, and a mechanical lock between this handle and the casing so that the spindle cannot be moved when the handle hangs down, the lock being released by raising the handle, which remains raised as long as the tap is turned on."

The mechanical lock between the handle and casing consists of a slotted jaw on the handle and a slotted flange or rib on the casing; the sides of the slot in the handle jaw being adapted to engage the sides of the flange or rib on the casing when the tap is open. The operating lever or bracket is provided with a projection which engages with a slot in the casing to limit the angular motion of the valve spindle.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Sept. 1.]

Nos. 20,692—21,275.

ASKEY, J.—"Gas heaters." No. 21,119.
DEMPSTER & SONS, LTD., R.—"Valves." No. 20,702.
DIXON, L.—"Gas fires." No. 20,923.
FINLAYSON, T. C.—"Manufacture of gas." No. 20,960.
HARRIS, R. W.—"Pressure, &c., regulators for coal gas, &c." No. 21,133.
NEW STIMEX GAS STOVE CO., LTD.—See Dixon, L. No. 20,923.
SMITH, E. W.—See Finlayson, T. C. No. 20,960.
WOODALL-DUCKHAM (1920), LTD.—See Finlayson, T. C. No. 20,960.

[Extracted from the "Official Journal" for Sept. 8.]

Nos. 21,276—21,874.

BROWN INSTRUMENT COMPANY.—"Recording meters." No. 21,466.
BROWN INSTRUMENT COMPANY.—"Metering devices." Nos. 21,467, 21,469, 21,470.
BROWN INSTRUMENT COMPANY.—"Gas analysis apparatus." No. 21,748.
FLAVEL, P. W.—"Hot-plates for gas-cookers." No. 21,351.
JAMES, R. W.—See Brown Instrument Company. Nos. 21,466, 21,467, 21,469, 21,470, 21,748.
KOLLER, K.—"Gasification of caking coals in a gas producer." No. 21,454.
MACKAY, T. M.—"Collapsible hood for gas cookers." No. 21,400.
PEASE, E. L.—"Extraction of ammonia from coal gas, &c." No. 21,543.
RICHMOND GAS STOVE AND METER COMPANY, LTD.—"Water heater." No. 21,619.
RILEY, A.—"Handles of gas burners." No. 21,280.
ST. LEGER, A. A. H.—See Richmond Gas Stove and Meter Company, Ltd. No. 21,619.
SHEPPARD, H.P.—"Gas compressors." No. 21,557.
SUFFERN, E. S.—"Generation of gas." No. 21,577.
WALKER, T. G.—"Gas cock." No. 21,871.
WHEELER, F. CORNELIUS-.—"Air and gas ducts for ventilating." No. 21,589.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Gas Prices and Dividends.

SIR,—That the average price received for gas in (say) this period should determine the dividend in the following period is a feasible proposition. The nation does not wait for its fiscal year's profits to be ascertained, but taxes on the basis of the former period's result.

Sept. 11, 1926. OIKONOMIA.

MISCELLANEOUS NEWS.

NO FOREIGN COAL FOR WIGAN.

A lively debate in the Wigan Town Council, in connection with coal supplies for the Gas Department, followed a statement by the Mayor (Mr. J. M'Curdy) that the Department was unable to maintain the usual supply and pressure of gas owing to the poor quality of coal being supplied, and that the cost was considerably greater. Instead of paying £370 a week for coal, they were now paying £1000.

Mr. Green referred to the fact that the Committee had decided not to buy foreign coal. He blamed the Mayor, as Chairman of the Committee, for the position they were in. Other towns round about, he said, were buying foreign coal, and Wigan was the laughing stock of the country—in fact, it was the one dark spot on the map. What was more, the Gas Committee's action was not helping the miners. From the look of the streets of the town at night, one would think there was another war on. Some of the Labour members who had voted for foreign coal changed their minds afterwards; and the reason they gave was that they had been told, if they voted that way again, they were "down and out."

Alderman Farr urged that the goodwill of the Gas Undertaking was being undermined, and 30,000 consumers, mainly of the working class, were being punished. The electricity undertaking was being maintained; and he urged that the same rights should be exercised in connection with the gas-works.

Mr. Ramsden (Labour) said that all coal was "scab coal" now, and he was ashamed to see English coal coming into Wigan. He would not be flurried if there was neither gas nor electricity. He argued that, as in wars, so in industrial disputes, non-combatants were bound to suffer.

The Mayor replied, resenting any imputation on his honour; and after a lengthy discussion the Committee's action was confirmed in deciding not to buy foreign coal.

NO INCREASE AT BELFAST.

The recommendation of the Manager of the Belfast Gas-Works (Mr. J. D. Smith) that there should be an increased charge for gas of 4d. per 1000 c.ft. net on ordinary meters and 2·38d. per 1000 c.ft. net on slot meters, came before a special meeting of the Belfast City Council on Tuesday, the 7th inst., when the proposal was turned down by 22 votes to 18.

In moving the adoption of the minutes authorizing the increase, Mr. M'Laurin (the Chairman of the Gas Committee) said it was a very distasteful duty, both for the members of the Committee and also for Mr. Smith. The miners' strike had, however, dragged on so long that the loss on the undertaking had been about £9000 a month. Owing to the shortage of coal, there had been an enormous demand for gas—the output having increased 1 million c.ft. a day. Again, Belfast had not suffered as to public lighting.

Mr. Hodgin, seconding, remarked that the matter had been considered very carefully by the Committee, and they had deferred the evil day until the last moment.

Opposition to the proposal was voiced by Mr. Agnew, who argued that the increase would fall very heavily upon the poorer classes who used penny-in-the-slot meters and gas rings to cook their food. He suggested that they should wait until the end of the financial year, and then curtail accordingly whatever sum was given to the rates. Mr. Midgley, on behalf of the Labour party, also expressed hostility to the increase. Last year the gas undertaking made as much surplus as would have met this increased charge; and he was confident that in the current year there would be sufficient revenue to meet the charge without putting it on the backs of the workers.

In the course of subsequent discussion, several amendments were suggested; but the Lord Mayor (Alderman Sir William Turner), who presided, stated that he could only accept an amendment that the minute be referred back to the Committee. The Lord Mayor reminded the Council that they had a duty to discharge to the whole of the ratepayers. While he appreciated what had been said with regard to the poorer classes of the people, the Committee had not ignored their claim, as the increase in the case of slot meter consumers would be less than 2½d. per 1000 c.ft.

Sir William Coates (the Chairman of the Finance Committee) thought the proposal very reasonable in the present emergency. It was only right, he thought, that the Gas Department, as well as others, should contribute to reduction of the rates.

Accidental Gas Poisoning.—Miss Clara Featherstone (aged 64), who was very deaf, and who had lost her sense of smell, was found in a sitting position on the floor in the kitchen of her house at Tunbridge Wells. There was a strong smell of gas, and a big burner of the gas stove was turned full on. As the kitchen window was shut, and there was no draught, it was surmised that after using the stove the sleeve of her dress had caught in the tap and turned it on. Not smelling the gas, she was unaware that this had occurred, and so was overcome.

Successful Year at Morpeth.—The gross profits of the Morpeth Gas Company for the past twelve months, at £3379, are the largest in the history of the undertaking; and the same remark applies to the dividend of 7 p.ct. per annum, free of tax, paid on the ordinary shares. In making these announcements at the annual meeting, the Chairman (Mr. Ralph Crawford) congratulated the shareholders on the highly satisfactory results of the year's working. He also stated that an extension of the contract for public lighting has been arranged for a further period of five years, on terms which should prove mutually satisfactory to the Council and the Company, and by which the lighting of the town will be greatly improved.

PLYMOUTH COMMITTEE OF INQUIRY.

Municipal Life Above Suspicion.

The report of the Special Committee of Inquiry into the administration of the various municipal departments, to which reference was made in the "JOURNAL" for Sept. 8 (p. 546), was presented to the Plymouth Town Council at their meeting on Monday of last week.

Moving its adoption, the Deputy Mayor (Mr. J. E. Pillar) said allegations had been made against officials and departments; but as far as the Special Committee had gone, there had been no foundation for any such allegations. They had been very careful in their investigations; and he thought they might congratulate themselves that the business of the town was solid at the core, and that its municipal life was above suspicion. As to materials and stores, the strangest thing was that the department whose books and stores were in the best condition was the Gas Department. When they went to the gas-works, they made the stock-keeper prove his stocks and books, and he was able to do so.

The report was adopted without opposition, and a resolution was passed instructing the Committees concerned to consider it without delay, and to take steps to put the proposals into operation. Meanwhile the Special Committee of Inquiry continue to hold office.

INCREASES IN THE PRICE OF GAS.

Further Results of the Coal Stoppage.

The Bradford Corporation have increased the price by 3d. per 1000 c.ft. (bringing it to 4s.), to apply from the beginning of October. The Gas Committee's recommendation was an increase of 6d., but the Finance Committee last week approved only 3d. increase.

The Chester United Gas Company have found it necessary to increase the price for domestic use by 1d. per therm.

The Coleraine Urban District Council have decided to increase the price of gas from 4s. 2d. to 5s. per 1000 c.ft. The Chairman (Mr. Daniel H. Christie) said the Council were now paying 67s. per ton for coal, as compared with 30s. before the coal strike. They were sorry that the increase was necessary, as they had hoped to reduce the price before the winter to 3s. 9d. per 1000 c.ft.

The price at Crieff is to be raised from 5s. to 5s. 5d. per 1000 c.ft.

The Croston Council have decided to apply for sanction to increase the maximum gas charge from 5s. 6d. to 7s. 6d. per 1000 c.ft.

The Denholme District Council have increased the price by 6d. per 1000 c.ft., making it 5s. 6d. per 1000 c.ft.

The Kirkby Stephen Gas Company announce that, as their supply of coal is practically exhausted, they have had to buy stocks at a big price, and must now increase the price of gas and ration the supply to seven hours a day.

The Gas Committee of the Monifieth Town Council have increased the price from 4s. 9d. to 5s. 3d. per 1000 c.ft., chargeable since the date of the last meter survey.

In the area of the North Middlesex Gas Company, the charge is being raised by 0·7d. per therm.

The price at Oswaldtwistle has been increased by 1d. per therm, equal to 4d. per 1000 c.ft.

The Plymouth Town Council have authorized the Gas Committee to increase the charges made to the various classes of consumers of their Devonport undertaking. It was stated on behalf of the Committee that the increases were made with very much regret, but resulted from a state of things brought about by no fault of their own. The Committee found themselves with a deficit of £8000, directly attributable to the coal strike. The increase to ordinary consumers of 3d. per 1000 c.ft. did not meet the deficiency, as 1d. yielded roughly £2000, and they had also to allow for extra expenditure during the winter. The Committee, however, had resolved to draw the balance necessary from the reserve fund, which now stood at £12,000. Profits made in the future, it was stated, would be applied so as to benefit the gas consumers, and not the ratepayers as a body.

The Directors of the Rowley Regis and Blackheath Gas Company announce an increase of 6d. per 1000 c.ft. for ordinary consumers, to take effect from Sept. 1.

The Silsden District Council have increased the price by 1·3d. per therm.

The Southgate and District Gas Company give notice that they are obliged to raise their charge 0·8d. per therm.

As from Sept. 29, the Teignmouth Urban Council are increasing the price to ordinary consumers by 1d. per therm, and altering slot meters to give 15 c.ft. per 1d.

The Directors of the Tynemouth Gas Company intimate an increase in price, on both the ordinary and the prepayment system, by 1d. per therm. The increase, which will be charged in the December accounts, will cover the whole of the Company's area of supply.

The Directors of the Wandsworth, Wimbledon, and Epsom District Gas Company intimate that there will have to be an increase in price of 1·6d. per therm (approximately 7½d. per 1000 c.ft.) from the taking of the meter indices at the Michaelmas quarter. This will apply to all consumers in all areas supplied by the Company.

The Wellington (Salop) Gas Company have decided, from the end of the current (September) quarter, to increase the price in the Wellington area by 2d. per 1000 c.ft., and in the Oakengates area by 4d. per 1000 c.ft. The discounts to users of prepayment meters will be withdrawn.

The York Gas Company have increased the price, as from the September meter readings, by 1½d. per therm to all consumers.

GAS REGULATION ACT APPLICATIONS.

There have appeared in the "London Gazette" the following notices regarding applications to the Board of Trade under the Act.

AMENDING ORDERS.

Eastbourne Gas Company.

Application is to be made to substitute for the standard price of 14·6d. per therm a standard price of 16·2d. per therm.

The undertakers propose that the substituted standard price shall operate as from the date of the application for the duration of the present coal stoppage, and thereafter until the expiration of the next full half-year ending June 30 or Dec. 31, as the case may be, and such further period as the Board of Trade may determine.

Tottenham District Light, Heat, and Power Company.

The Company desire to substitute for the standard price of 13·8d. per therm a standard price of 14·8d. per therm, for the duration of the coal stoppage and thereafter until the expiration of the next full half-year ending June 30 or Dec. 31, as the case may be.

GAS REGULATION ACT ORDERS.

We have received from the Director of Gas Administration a copy of the following Order made by the Board of Trade under section 1 of the Gas Regulation Act.

Nelson Corporation.

After the declared date, the prices of 14·2d. and 15·4d. per therm shall be substituted respectively for the prices of 5s. and 5s. 6d. per 1000 c.ft. mentioned in section 50 (limiting charge for supply of gas) of the Nelson Water and Gas Act, 1866.

After the declared date, the word "therm" shall be substituted for the words "1000 c.ft." where they secondly occur in paragraph (1) of section 22 (for the protection of the district of the Brierfield Local Board) of the Nelson Local Board Act, 1888: and "0·6d. per therm" shall be substituted for "3d. per 1000 c.ft." in that paragraph. The words "2·4d. per therm" shall be substituted for "1s. per 1000 c.ft.," and "1·8d. per therm" shall be substituted for "9d. per 1000 c.ft." in article 1 of the Nelson Order, 1895.

PARKINSON AND W. & B. COWAN, LTD.

Annual General Meeting.

The Twenty-Sixth Annual Ordinary General Meeting of Messrs. Parkinson and W. & B. Cowan, Ltd., was held at the Fitzalan Street Works, Kennington Road, S.E., on Sept. 1—Sir HENRY COWAN, M.P., Chairman of the Company, presiding.

The CHAIRMAN, in moving the adoption of the report and accounts (an abstract of which appeared in the "JOURNAL" for Sept. 8, p. 548), remarked that when the Directors met the shareholders last year, they were obliged to tell them that during the six months of the period to which the accounts then referred, the Company had, in the home gas meter business, to meet very keen and extensive price competition, the effect of which had been to reduce the profits of the year's trading in comparison with former years. Unfortunately this keen price competition continued throughout the ensuing twelve months. The result was that their two most important subsidiaries engaged in the gas meter business made considerable losses; and had it not been for the satisfactory results achieved by some of their other subsidiaries, they would not have been in a position to maintain the usual rate of dividend. They had been fortunate, however, in receiving from their other subsidiaries dividends which enabled them to recommend the declaration of a final dividend of 5¼ p.ct. on the ordinary shares, making 8 p.ct. for the year. There were few companies exclusively engaged in the gas meter business who had been able to pay out of the year's profits the dividends paid in previous years; and he thought that the Directors were entitled to congratulate the shareholders on the fact that the Company's subsidiaries were engaged in industries which did not compete with each other and which were not necessarily affected by depression or competition in any one of them. They were able to carry forward more than double the amount which was brought into the accounts from the previous year—and this after paying dividend on a larger amount of ordinary capital than they had ever had to pay on before. The position of the gas meter industry was not so desperate as it was; and since June they had been obtaining materially better prices. They hoped that, as a result of this improvement, they would be able to make good the losses they had sustained, and at no distant date to receive dividends from their home gas meter subsidiaries. The progress of the Parkinson Stove Company, Ltd., was so satisfactory that it was necessary again to raise additional capital. Instead of financing the operations of that Company out of the resources of the Parent Company, as hitherto, the Directors had arranged for the Stove Company to issue on its own behalf 200,000 7 p.ct. preference shares of £1 each.

Mr. F. W. CHURCH seconded the resolution, which was carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. C. WEBB, it was unanimously resolved: "That there be paid on Sept. 1 a final dividend on old ordinary shares of 5¼ p.ct., making with the interim dividend a total dividend for the year of 8 p.ct., and a proportionate dividend on the instalments paid up per share of the new issue of March 10, 1925 (both subject to income-tax), and that there be carried forward to next account £28,608."

At Millom, Cumberland, the use of gas for public functions after 10.30 p.m. has been prohibited for the duration of the coal stoppage.

DISSATISFACTION WITH ELECTRICITY AT ELTHAM.

Woolwich Borough Council's Mistaken Policy.

"Some 500 housewives who are occupants of houses on the Woolwich Borough Council's estate on Eltham Hill are up in arms against the enforced use of electricity for every household purpose," said the "Morning Post" for Sept. 9.

The mistaken policy of the Council was the subject of an editorial in the "JOURNAL" for Sept. 1; and what follows is taken from the issue of the "Morning Post" referred to above.

The houses, of which the Council are the landlords, have been equipped with electric cookers at a cost of £10,000, so that the borough may benefit from their own electricity undertaking; but this large expenditure does not, in the opinion of a great majority of the householders, compensate for the fact that it is proving exceedingly expensive to the tenants.

A deputation of tenants recently waited on the Council to demand that the clause in their leases which forbids the installation of gas should be deleted; but the reply of the Council was: "We will consider the matter, and let you know."

"Even with a flat rate of 2d. per unit for lighting and power, we find that cooking costs us just six times as much as would the use of gas," one of the tenants stated recently. "Representatives of the South Metropolitan Gas Company have called upon us, and offered to put in gas cookers free of charge; but under the terms of our agreements we are bound to refuse."

"While the Council are adopting a 'wait-and-see' attitude, a large number of us are doing our cooking on oil stoves. Although the electric oven is very successful, it costs me 3½d. to boil a kettle of water; and if I did not use an oil stove, it would cost me 7s. to 8s. a week for the cooker."

Over 313 tenants have signed the petition to the Council.

TRADE NOTES.

Large Pipe Contract.

A contract for 20,000 tons of pipes, representing £500,000, has been secured by Messrs. Braithwaite & Co., Ltd., of Westminster. The contract is for the Rio Clara (Brazil) water supply, and provides that all materials shall be of British make.

Keith "Textile" Fittings.

The James Keith and Blackman Company, Ltd., of 27, Farringdon Avenue, London, E.C., have had placed with them by a large textile mill in Nelson (Lancs.) an order for 426 of their "Textile" gas fittings, complete, together with a "C" size compressor for supplying gas at the requisite pressure of 10 in.

The Howard Locomotive.

Messrs. James & Frederick Howard, Ltd., of Bedford, have sent us particulars of a new internal combustion locomotive which should prove of interest to gas engineers. This locomotive possesses some novel features, including fool-proof gear change and exceptional haulage capacity on steep gradients through an auxiliary rubber-tyred wheel running on a central wooden track. The first of these locomotives is at work at Leicester.

Sugg Lamps and Fittings.

Lamps and fittings for the exterior and interior lighting of shops, factories, offices, institutions, and private premises are shown in profusion in the newly-issued catalogue of Messrs. Wiliam Sugg & Co., Ltd., of Ranelagh Works, Chapter Street, Westminster, S.W. This new edition includes many novelties in interior gas fittings, which will doubtless find their way into the showrooms of gas undertakings. The range of aluminium burners and glassware is extensive.

Conveyor and Elevator Chains.

Special attention has been devoted by Messrs. Hans Renold, Ltd., of Burnage Works, Didsbury, Manchester, to the design of conveying and elevating chains; and a new publication (Ref. 8006) describes the hollow stud and block types. The former is particularly adaptable; and various attachments for special purposes can readily be secured to the base chain. The block chains are exceptionally robust, giving lightness with strength. Other chains have been developed to meet requirements for a special heavy-duty chain. Throughout these series the Renold reputation for quality has been maintained; and the standards of precision and workmanship in manufacture are the same as for their steel driving chains. The firm's technical department maintain a staff of engineers, who are prepared to advise and assist in the selection of suitable chains.

The "Birtley" Pneumatic Separator.

The Birtley Iron Company have published a booklet describing and illustrating the "Birtley" pneumatic separator for cleaning coal. In this it is stated that millions of tons of coal are now being cleaned per annum on the North American Continent on Sutton Steele tables. These tables are capable of such accurate regulation as to enable the most difficult coals to be treated in all sizes from the product going through a 4-in. bar screen down to fine dust. The Birtley Iron Company are the sole licencees and manufacturers under Messrs. Sutton Steele & Steele's patents and those of the American Coal Cleaning Corporation, and have been adapting them to suit English conditions during the past two years. In this period tests have been carried out on coals from almost every English and Scotch coalfield, with very successful results. Commercial plants handling up to 150 tons per hour are in operation or under construction; and the firm are prepared to undertake the design and construction of plants to treat 10 tons per hour upwards. A complete plant, equipped with mechanical handling facilities and commercial tables, is available in the firm's works for testing individual coals, while a fully-equipped laboratory and experienced technical staff are at the disposal of companies who are considering coal preparation.

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

The discussions of the past week between the Government, the owners, and the men have not given rise to any fresh activity in the coal market. Chartering for import cargoes from overseas is still the chief business on 'change, and the possibility of early negotiations does not appear to be damping the ardour of the foreign producers who have benefited so long from the stoppage. The serious aspect is the benefit they will have derived by obtaining a fair hold in many of our export markets. It is to be feared that many more of our usual long-term export contracts will go elsewhere unless a settlement is arrived at soon. As matters stand, it is impossible for collieries or exporters to secure any forward business, as prices must naturally depend upon the ultimate labour costs. Quotations at present can only be such as will safeguard producers whatever the terms may be, and are consequently hardly worth giving except for odd cargoes immediately after the reopening of the pits. Very few collieries, if any, are now giving any indications.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

Gas undertakings appear to be well provided for regarding coal supplies for some time ahead; and with deliveries of American and Westphalian gas coals giving practically equal satisfaction in regard to the yield of gas with British coals, there is no reason for anxiety. In several instances collieries have made sales to cover the first six or twelve months after resumption of work at figures slightly in advance of those operating elsewhere.

COAL TRADE IN THE MIDLANDS.

From Our Local Correspondent.

In many areas gas is now being supplied almost entirely by the aid of American coal. As the cost of these supplies is about thrice the contract prices which ruled at the time the pits at home stopped, it is not surprising that indemnification is being called for from the consumer.

There has been little change in American gas coal prices except in so far as the advance in freight rates has pushed them up. Shipments have so increased that as the cargoes arrive it is difficult to obtain berths at the ports. Suppliers complain of frequent delays from this cause. More industrial fuel is coming forward from home sources; but there would be no difficulty in disposing of much larger allocations than the manufacturing centres are getting, even at the enhanced prices.

The winning of outcrop coal is still being developed. Some improvement in the quality is noted as the workings penetrate deeper beneath the crust, but low efficiencies are putting great hindrances in the way of manufacturers now. The relaxation of the control regulations has not had any appreciable effect in accelerating the distribution of household supplies. Prices vary rather widely.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Sept.* 13.

There is more activity in the pitch market. Continental buyers are now inquiring more freely, and, owing to the shortage of supplies, there has been a sharp advance in price to about 120s. per ton net in bulk at makers' works.

There is practically no creosote available for sale over the next few months, and there is no standard quotation; the price for such quantities as come into the market being a matter for negotiation.

Tar spirits continue in demand. Pure toluole is firm at about 3s. 9d. per gallon into buyers' drums, at makers' works. Pure benzole is about 3s. to 3s. 3d. per gallon. Solvent naphtha is 2s. 3d. to 2s. 4d. per gallon for 95/160 quality.

Tar Products in the Provinces.

Sept. 13.

The markets for tar products have remained firm, with a very keen demand for any material which is available for near delivery.

In pitch there is a good demand from the Continent owing to the request for continental fuel due to the fact that coal is difficult to obtain at reasonable prices; and for near delivery very high figures are quoted.

The average values of gas-works products during the week were: Gas-works tar, 70s. 6d. to 84s. 6d. Pitch, East Coast, 110s. to 112s. 6d. f.o.b. West Coast—Manchester, 102s. 6d. to 105s.; Liverpool, 105s. to 107s. 6d.; Clyde, 108s. 6d. to 110s. 6d. Benzole, 90 p.ct. North, 1s. 11d. to 2s.; crude, 65 p.ct. at 120° C., 1s. 4d. to 1s. 5d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 11d. to 2s. Toluole, naked, North, 1s. 11d. to 2s. nominal. Coal-tar crude naphtha, in bulk, 9d. to 9¼d. Solvent naphtha, naked, North, 1s. 9d. to 1s. 10d. Heavy naphtha, North, 1s. 1d. to 1s. 2d. Creosote, in bulk, North, liquid, 7⅞d. to 8d.; salty, 7½d. to 7⅝d.; Scotland, 7⅞d. to 7⅞d. Heavy oils, in bulk, North, 7½d. to 7⅝d. Carbolic acid, 1s. 4d. to 1s. 5d. prompt. Naphthalene, £11 to £14; salts, 90s. to 100s., bags included. Anthracene "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Co-Partnership at Watford.—In their report for the year ended June 30, the Co-Partnership Committee of the Watford Gas and Coke Company state that the bonus and interest paid during the year shows an increase, and amounts to £1187.

House Heating by Gas in Baltimore.

Remarking that during the last heating season 1300 Baltimore homes were heated entirely by gas, the total consumption being 700 million c.ft., the "American Gas Journal" quotes Mr. Eugene D. Milener (Industrial Engineer to the Consolidated Gas, Electric Light, and Power Company of Baltimore) as saying: This 700 million c.ft. of gas replaced 20,000 long tons of anthracite coal or 500 40-ton car loads. It would have required 667 3-ton trucks to haul this coal from local yards to the consumers' houses. Assuming each truck would travel about 2 miles, the city was saved 13,334 miles of coal-truck traffic. Furthermore, about 2000 tons of ashes were saved. These ashes would have had to be dumped into carts on the premises, and hauled through the streets, leaving a trail of dust for miles. The city was saved all this. These Baltimoreans saved first more than 600,000 trips to the cellar last winter. The physical energy saved from these trips to the cellar was available for better things. And the time saved by not tending coal fires was 60,000 hours. As a labour saver, house heating by gas leads the procession of household conveniences.

No Increase at Oldbury.—The Oldbury Urban District Council have decided not to increase the price of gas. Mr. K. H. Wilson (Chairman of the Gas Committee) said it was anticipated that they could carry on the full supply for at least another month or six weeks.

Metal Discs in Coin Meters.—At Swadlincote, a widow named Agnes Vallance was fined 12s. 6d., and ordered to pay for the gas she had taken. It was stated that she obtained a supply by using metal discs instead of pennies. Defendant said she intended to pay for the gas as soon as the strike was over.

Coatbridge Gas Company's Results.—The sales of gas for the twelve months ended June 30 amounted to 1,312,454 therms, being an increase of 24,951 therms, or 1·94 p.ct. compared with the previous year. Payment of dividends at the same rates as last year are recommended—viz., £14 5s. p.ct. per annum on the original stock, and £9 19s. 6d. p.ct. per annum on the four issues of £10 shares, all less income-tax.

Mishap at the Leatherhead Gas-Works.—At the Leatherhead Gas-Works last Wednesday, owing to a fracture, gas passed into the engine house, and an explosion followed. The roof, which was a light one, was blown off, but no damage was done to the exhausters or compressors, and no one was injured. As a result of the mishap, Byfleet was without gas for a couple of hours during the afternoon; but the supply was resumed for the tea load.

Socialist Bias and Public Inconvenience.—Cudworth is a considerable township in the West Yorkshire colliery area. When the stocks of coal at the gas-works ran out, owing to the miners' strike, the local District Council, having a strong Socialist majority, declined to buy "blackleg" coal, and the gas supply stopped in the middle of August. The Socialist contention that the decision, despite its inconvenience to the public (who have been reduced to using candles), was one which the whole township favoured has been challenged. The population is largely mining, with a strong element of railwaymen; and the latter may not be quite so willing as the miners to sacrifice comfort at home.

Shrewsbury Gas Light Company.—At the annual meeting of the Company, a dividend of 6 p.ct., less tax, for the past year was declared. The Chairman (Mr. J. B. Lloyd) said that, in spite of the coal strike and the largely increased demand for gas, the Company had been able to maintain a full supply for consumers. Rates and taxes showed an increase of £883. Receipts for gas revealed a decrease of £2739, due to the reduced price. The quantity sold was over 43,000 therms (9,000,000 c.ft.) more than in the previous year. The gross receipts were less by £3332, and the expenditure by £4562. The balance of net revenue account was £9713, which, after paying the recommended dividend, would provide £6216 to carry forward, as against £6453 last time. The fittings business continued to expand. The report and statement of accounts were adopted.

Courageous Act Rewarded.—On Aug. 14 one of the employees of the Leamington Gas Company—Mr. F. C. Sheward—pluckily rescued a small boy from the canal. In spite of the fact that he was a non-swimmer, Mr. Sheward dived into the canal when he saw the boy in difficulties, and was successful in bringing him safely to the side. He applied artificial respiration (having been taught how to do so at the Company's ambulance classes), and after some time succeeded in reviving the boy, who is now none the worse for his experiences. Mr. Sheward's fellow workers subscribed to a testimonial fund, and on Sept. 2 Mr. James Parker (Chairman of the Men's Committee) presided at a well-attended meeting in the Mess Room. He explained why the meeting had been convened, and asked Mr. R. S. Ramsden (General Manager and Engineer to the Company) to present to Mr. Sheward a clock, in an oak case, in recognition of his gallant action. Mr. Ramsden said the Directors had been happy to hear of Mr. Sheward's bravery, and on their behalf he presented to him a cheque.

The Southport Corporation Gas Committee propose to make application to the Ministry of Health for sanction to borrow £20,000 for the provision of gas cookers, fires, and boilers.

The annual statement of accounts of the Barrow-in-Furness Corporation, for the year ended March 31, shows that over two-thirds of the houses in the borough have prepayment meters.

Seventy £10 5 p.ct. cumulative preference shares, 63 £1 5 p.ct. preference shares, and 10 £10 original ordinary shares in the Brixham Gas Company were offered for sale by auction by Messrs. Dugdall & Son. The highest bid for the lot was £700, and the shares were withdrawn.

STOCK MARKET REPORT.

In spite of the approaching termination of the twenty-one-day account, a satisfactory volume of business was done. The hopes of settlement of the coal stoppage were not realized, and the prospects at the time of writing appear to be receding. This will doubtless have a restricting influence on business during the current week; but there is a considerable amount of money awaiting investment, and the outlook, if only a settlement could be reached, is extremely promising. In the meantime, the first of the autumn new issues has been announced.

Although many gas companies require new capital, it is unlikely, except in the most pressing cases, that issues will be made until values are materially higher. Slowly but surely prices are improving. Alliance and Dublin ordinary rose three points on the week; Croydon sliding-scale 1 point, and the max. div. 1 point; and the three Sheffield stocks 1 point each. The consolidation of the Portsea Island stocks under the Company's new title (Portsmouth Gas Company) appeared for the first time on the Stock Exchange List last week; the 4 p.ct. consolidated stock being quoted at 102-107, and the 5 p.ct. max. stock at 78-81. These two stocks are now embodied in the Table. The change should bring about an improvement in the market values. The present yield on the average market value is £6 17s. 10d. p.ct. per annum on the 4 p.ct. stock, and £6 5s. 9d. p.ct. per annum on the 5 p.ct. max. stock. It may be observed that the Bournemouth Company are now the only undertaking operating in England still working on "Share" capital. Attention has been drawn to the authorized rate of dividend that will be payable by the Gas Light and Coke Company for the current half-year. It is understood that the minimum rate of 5 p.ct. payable under the powers of the Company's new Act will operate from October 1, so that the authorized dividends for the half-year will be an average of £5 1s. 4d. p.ct. in respect of the first three months, and £5 p.ct. in respect of the second three months, or £5 0s. 8d. for the half-year.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Sept. 10.	Rise or Fall on week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Aug. 12	6	6	Aldershot 5 p.c. max. C.	72—75	..	..
322,992	"	"	4	4	Do. 4 p.c. Pref.	65—70	..	..
1,551,868	"	Apl. 1	6½	6½	Alliance & Dublin Ord.	85—90	..	..
374,000	"	July 8	4	4	Do. 4 p.c. Deb.	67—70	+3	84½—85
300,000	1	May 6	1/7½	1/7½	Bombay, Ltd.	⅛—1⅛	+4	..
500,050	10	Aug. 26	8½	8½	Bournemouth 5 p.c.	11⅜—12⅜*	..	..
275,000	10	"	7	7	Do. B 7 p.c.	11⅜—12¼*	..	..
50,000	Stk.	June 24	6	6	Do. Pref. 6 p.c.	11—12*	..	12
162,025	"	"	3	3	Do. 3 p.c. Deb.	54—57	..	11⅛
214,740	"	Aug. 26	4	4	Do. 4 p.c. Deb.	74—77	..	..
244,200	"	"	12	12	Brighton & Hove Orig.	163—168*	..	..
1,387,500	"	July 22	9	9	Do. A Ord.	125—130*	..	..
855,000	"	Mar. 18	5	5	Bristol 5 p.c. max.	85¼—86¼a	..	..
100,000	"	June 24	8	7	British Ord.	102—107	+½	85—85⅞
120,000	"	"	7	7	Do. 7 p.c. Pref.	114—119	+2	104—105
100,000	10	"	4	4	Do. 4 p.c. Red. Deb.	68—73	..	..
100,000	10	Apl. 22	8	8	Cape Town, Ltd.	6⅛—7⅛	..	..
150,000	Stk.	June 24	4½	4½	Do. 4½ p.c. Pref.	6—7	..	7⅛
626,860	"	July 22	4½	4½	Do. 4½ p.c. Deb.	68—73	..	..
237,860	"	June 24	6	6	Cardiff Con. Ord.	94—97	..	..
157,150	"	Aug. 12	7½	7½	Do. 7½ p.c. Red. Deb.	99—102	..	..
79,185	1	Apl. 22	6½	5	Chester 5 p.c. Ord.	88—93b	..	..
24,495	1	"	†2/-	†2/-	Colombo Ltd. Ord.	28/—30/-	..	..
1,613,280	Stk.	Aug. 12	1/4⅜	1/4⅜	Do. 7 p.c. Pref.	20/—22/-	..	..
560,000	"	"	5⅛	5⅛	Commercial 4 p.c. Cap.	77—80	..	..
475,000	"	"	5/8/4	5/8/4	Do. 3½ p.c. Cap.	74—77	..	78—80
800,000	"	June 24	8	8	Do. 3 p.c. Deb.	55—58	..	..
200,000	"	Oct. 8	—	4	Continental Union, Ltd.	25—30	..	55½
737,150	"	Mar. 4	7	7	Do. 7 p.c. Pref.	85—88	..	27½—28½
408,100	"	Aug. 12	6½	6½	Croydon sliding scale	95—98	..	..
492,270	"	"	5	5	Do. max. div.	78—81	+1	96—96½
55,000	"	Aug. 26	6	9	Derby Con.	107—109c*	+1	78½—79⅝
309,000	"	June 24	4	4	Do. Deb.	73—75c	..	..
50,000	"	Mar. 4	5	5	East Hull Ord. 5 p.c.	86—89	..	..
1,002,180	"	June 24	5	5	Eastbourne 5 p.c. Deb.	91—96	..	..
13,788,960	10	Apl. 1	†6	†4	European, Ltd.	5—6	..	..
2,600,000	Stk.	Aug. 12	4/17/4	5/1/4	Gas Light & Coke 4 p.c. Ord.	83½—85½	+½	5—5⅝
4,157,020	"	"	3½	3½	Do. 4 p.c. Con. Pref.	56—61	..	84—85
5,602,620	"	"	4	4	Do. 3 p.c. Con. Deb.	74—77	..	60—60½
181,315	"	June 24	3	3	Do. 6 p.c. Br'tf'd Rd. Db.	58—61	..	75—76
130,000	"	"	—	—	Do. 10 p.c. Bonds.	100—105	..	59½
42,000	"	—	10	10	Do. 7½ p.c. Ilford Deb.	..	..	104—104½
82,500	"	—	7½	7½	Hastings & St L. 5 p.c. Conv	..	..	..
258,740	"	Aug. 26	6⅔	6⅔	Do. 3½ p.c. Conv.	87—92*	..	..
70,000	10	"	5½	5½	Hongkong & China, Ltd.	66—71*	..	89½—89⅝
173,200	Stk.	June 10	†10	†10	Hornsey Con. 3½ p.c.	19½—20½	..	..
1,976,000	"	Mar. 4	5	5	Imperial Continental Cap.	69—71	..	..
226,170	"	May 20	10	‡10	Do. 3½ p.c. Red. Deb.	122—127	..	..
235,242	"	Aug. 12	3½	3½	Lea Bridge 5 p.c. Ord.	68—71	..	123—125
2,127,340	"	Aug. 12	6½	6½	Liverpool 5 p.c. Ord.	92—97	..	..
600,000	"	Aug. 12	6½	6½	Do. 7 p.c. Red. Pref.	79—80b	..	..
165,786	"	Mar. 18	7	7	Maidstone 5 p.c. Cap.	102¼—104¼b	..	..
63,480	"	Aug. 26	9	8	Do. 3 p.c. Deb.	112—117*	..	..
75,090	"	June 24	8	8	Malta & Mediterranean	53—58	..	114—115
541,920	5	June 24	3	3	Montevideo, Ltd.	5½—5⅝	..	..
2,061,315	Stk.	May 20	†6	†7	Newcastle & Gateshead Con.	79—82	..	..
360,929	"	Aug. 12	†6	†6	Do. 4 p.c. Pref.	70⅞—71¼d	..	5½—5⅝
529,705	"	"	5	5	Do. 3½ p.c. Deb.	73—74d	+½	..
15,000	"	June 24	4	4	North Middlesex 10 p.c.	68½—69d	..	..
91,530	"	Aug. 26	3½	11½	Do. 7 p.c.	151—156*	..	..
300,000	"	"	11½	8½	Oriental, Ltd.	109—114*	..	..
188,120	"	May 6	8½	7	Plym'th & Ston'house 5 p.c.	96—101	..	..
414,500	"	June 24	7	7	Portsm'th Con. Stk. 4p.c. Std.	108—113	..	100
236,732	"	Aug. 26	7⅛	7⅛	Do. 5 p.c. max.	102—107	..	111
2,289,909	1	"	—	7/1/0	Primitiva Ord.	78—81	..	103—103½
282,200	100	"	—	5/0/0	Do. 4 p.c. Red. Deb.	11/9—12/9	..	72—72½
600,000	Stk.	June 1	—	—	Do. 4 p.c. Deb.	83—85	+·/9	11/6—12/9
180,305	"	July 22	4	4	Do. B. Aires 4 p.c. Rd. Db.	67—69	..	..
256,847	"	June 24	4	4	Do. R'r P'te 4 p.c. Rd. Db.	67—69	+2	..
150,000	"	"	4	4	San Paulo 6 p.c. Pref.	67—69	+2	..
125,000	10	Mar. 18	6	6	Do. 5 p.c. Red. Deb.	7⅞—8⅛	+2	..
270,000	50	July 1	5	5	Sheffield A	44—47	..	..
419,968	Stk.	Mar. 18	5⅛	6	Do. B	100—102e	..	..
1,047,000	"	"	5⅛	6	Do. C	100—102e	+1	..
90,000	10	"	5⅛	6	South African	100—102e	+1	..
6,609,895	Stk.	June 11	4	—	South Met. Ord.	5—7	+1	..
1,895,445	"	Aug. 12	7	5	Do. 3 p.c. Deb.	90½—92½	..	..
734,000	"	July 8	3	3	Do. 4 p.c. Deb.	57—60	..	..
91,500	"	Mar. 4	6½	6½	Do. 6½ p.c. Red. Db.	102—104	..	91—92
1,187,795	"	Aug. 12	8½	8½	South Suburban Ord. 5 p.c.	114—116d	..	58½—58⅝
368,837	"	Aug. 12	6½	6½	Do. 5 p.c. Deb.	95—98	..	..
647,740	"	June 24	5	5	South'mpton Ord. 5 p.c. max.	92—95	..	..
121,275	"	Mar. 18	5	5	Do. 4 p.c. Deb.	77—80	..	97—97½
250,000	"	June 24	4	4	Swansea 7 p.c. Red. Pref.	68—73	..	..
200,000	"	Aug. 26	7	7	Do. 4 p.c. Deb.	100—102*	..	79½
120,000	"	June 24	6½	6½	Tottenham District A 5 p.c.	100—102	..	70½
882,275	"	July 22	7½	7½	Do. B 3½ p.c.	105—110	..	..
150,000	"	"	5½	6½	Do. 5½ p.c. Pref.	87—90	..	..
181,255	"	"	5⅝	5⅝	Do. 4 p.c. Deb.	99—101	..	..
258,251	"	June 10	4	4	Tynemouth Con. and New	73—76	..	..
197,294	"	Aug. 26	5	5	Uxbridge, Maidenhead, & Wycombe 5 p.c.	65½—66½d*	..	..
88,330	"	Aug. 26	6⅝	6⅝	Do. 5 p.c. pref.	85—90*	..	..
91,800	"	"	5	5	Do. 5 p.c. Maidenh'd	80—85*	..	..
"	"	"	6⅝	6⅝	Wandsworth, Wimbledon, and Epsom—	85—90*	..	..
30,000	"	July 8	8½	8½	Wandsworth A 5 p.c.	122—127	..	..
255,636	"	"	7	7	Do. B 3½ p.c.	102—107	..	..
412,450	"	"	5/19/0	5/19/0	Do. C and New	88—93	..	..
352,000	"	"	6⅝	6⅝	Wimbledon 5 p.c.	98—103	..	88
98,000	"	"	7½	7½	Epsom 5 p.c.	104—109	..	100
88,416	"	June 24	8	8	3 p.c. Deb.	54—57	..	..

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *Ex. div.
† Paid free of income-tax. ‡ Plus 8½ p.ct. p.a. special dividend.

The following transactions were recorded during the week:

On Monday, Alliance and Dublin 84¹¹⁄₁₆, 85, Bournemouth 7 p.ct. 12, Bristol 85, British 104, Commercial 4 p.ct. 80, Croydon sliding-scale stock 96, 96½, Croydon max. div. stock 78½, European 5, 5⅜, Gas Light and Coke 84, 84⅜, 84⅞, 85, 3½ p.ct. 60, 4 p.ct. preference 75¼, Imperial Continental 123½, Maidstone 5 p.ct. 114, Primitiva 11s. 6d., 11s. 7½d., 11s. 9d., 11s. 10½d., South Metropolitan 91, 91¾, 92, South Suburban 97, Southampton 4 p.ct. debenture 70½. Supplementary prices, Brighton and Hove 5 p.ct. debenture 94½, 95, Gas Light and Coke 5 p.ct. debenture 99½, 99¼.

On Tuesday, Bournemouth 6 p.ct. preference 11⅜, Bristol 5 p.ct. max. 85½, Croydon max. div. 79½, Gas Light and Coke 84¼, 84½, 85, 4 p.ct. preference 75, 76, Hastings 5 p.ct. stock 89½, 89¾, Imperial Continental 123½, Maidstone 5 p.ct. 115, Primitiva 11s. 9d., 12s., 12s. 6d., South Metropolitan 92. Supplementary prices, Gas Light and Coke 5 p.ct. debenture 99½, 99½.

On Wednesday, British 105, Gas Light and Coke 84¼, 84⅜, 84½, 84⅝, 85, 3½ p.ct. max. 60½, Gas Light and Coke (Brentford) 6 p.ct. debenture 104, 104½, Malta and Mediterranean 5¼, Primitiva 12s., 12s. 1½d., 12s. 3d., 12s. 4½d., 12s. 6d., 12s. 7½d., 12s. 9d., South Metropolitan 91¼, 91½, South Suburban 97½, Southampton 5 p.ct. max. 79½, Wandsworth 3½ p.ct. "C" 88, Wandsworth and Wimbledon 5 p.ct. 100. Supplementary prices, Gas Light and Coke 5 p.ct. debenture 99⅛, 99¼, Montevideo 6 p.ct. deb. 97⅜, 98¼, Wandsworth 3½ p.ct. new 88.

On Thursday, Bristol 5 p.ct. 85¾, Cape Town 7½, Commercial 4 p.ct. 78, 3 p.ct. debenture 55½, European 5⅜, Gas Light and Coke 84¼, 84⅜, 84½, 84⅞, 85, Imperial Continental 123, 124, 125, Malta 5⅜, Portsmouth 4 p.ct. standard 103, 103½, 5 p.ct. max. 79, 79½, Primitiva 12s., 12s. 1½d., 12s. 3d., 12s. 4½d., 12s. 7½d., South Metropolitan 91⅛, 91¼, 91½, 91⅜, 92, Wandsworth 3 p.ct. debenture 54½. Supplementary prices, Gas Light and Coke 5 p.ct. debenture 99¼, Montevideo 6 p.ct. debenture 98¼, South Suburban 7 p.ct. deb. 101.

On Friday, Commercial 3 p.ct. debenture 55½, Continental Union 27½, 28¼, European 5⅝, Gas Light and Coke 84¼, 84⅜, 85, 3 p.ct. debenture 59¼, Oriental 100, Plymouth and Stonehouse 5 p.ct. 111, Primitiva 12s., 12s. 1½d., 12s. 4½d., 12s. 5¼d., South Metropolitan 3 p.ct. debenture 58¼, 58½. Supplementary prices, Gas Light and Coke 5 p.ct. debenture 99¼, Liverpool 5 p.ct. std. ord. stock 78½, 78⅝.

Loan rates were easier in Lombard Street at the close of the week, and fresh accommodation was obtainable at 3½ p.ct. The issue of Treasury Bills at £4 13s. 3·25d. p.ct., or nearly 3d. p.ct. above the previous week's rate, caused discount rates to be slightly firmer.

Foreign Exchange business was on a small scale. There was a moderate recovery in the French franc, which closed at 169⅝, and the Belgian rate improved to 177¼. At Milan the rate was lower at 135⅝ lire; while Spanish pesetas, in the recovery after the recent slump, rose to 31·73¾. Sterling on New York closed firmer at $4.85 9/16. Silver was cheaper on India and China selling at 28⅛d. per oz. Gold remained at 84s. 11½d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on Dec. 3. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. and 3¼ p.ct.

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